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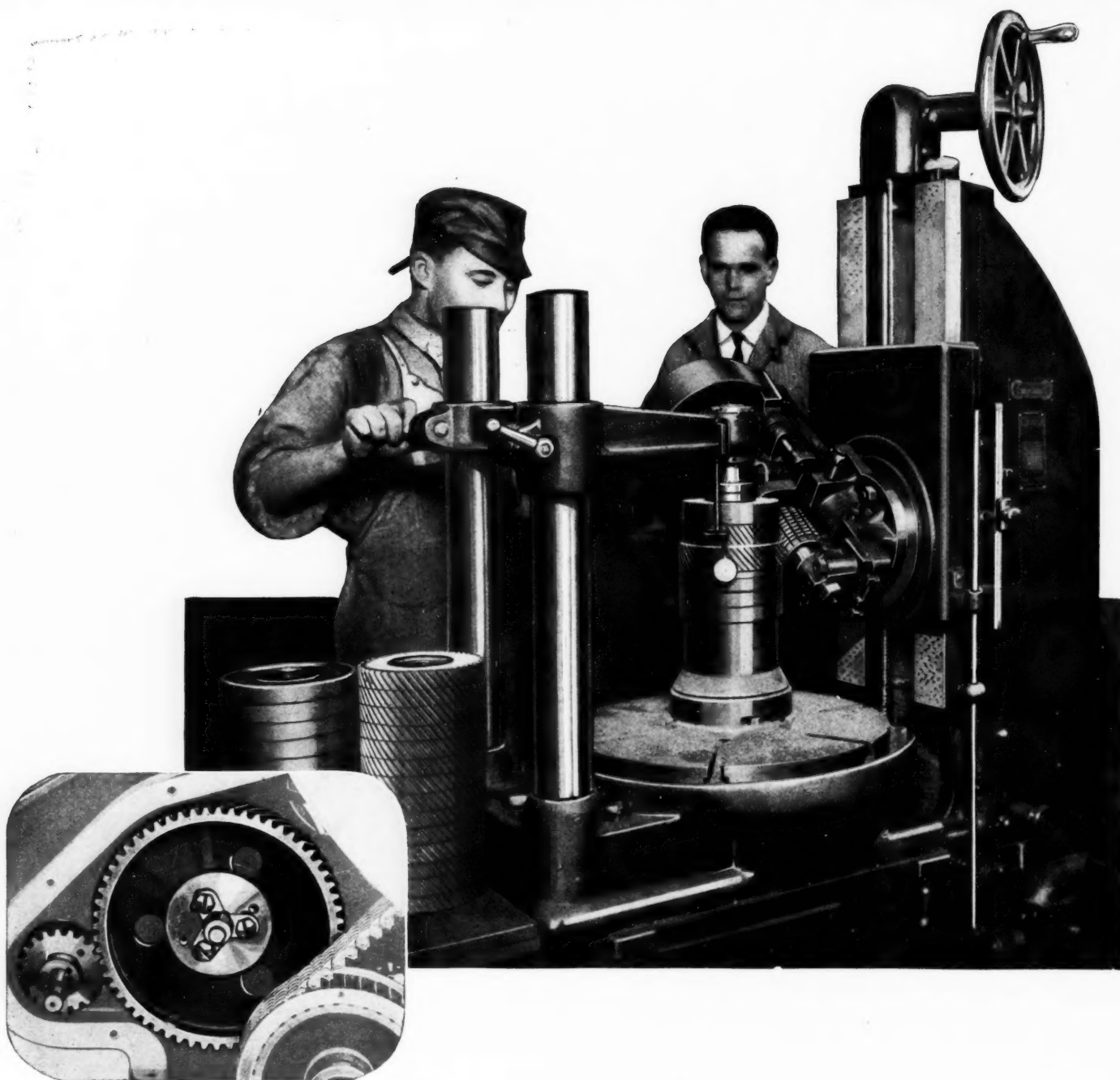
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No. 8

Chicago Favored for Next National Tractor Show

Aftermath of Columbus exhibit not favorable except as to local attendance. Capacity for producing farm products in greater quantity considered the best argument for the sale of tractors.

By David Beecroft

NEVER before at a national tractor exposition has the attention of tractor manufacturers been concentrated on one particular individual as at the National Tractor Show held at Columbus. That particular individual was a farmer. He was and still is the enigma of the tractor manufacturer as well as of the retail merchandiser of farm equipment.

The exposition assisted in crystallizing opinion as to the farmer and the very general conclusion is that he is still very much a creature of environment and climatic conditions. In winter when nature sleeps he enters into a period of business somnambulism, a condition of business coma, which continues until the spring sunshine, when he again becomes a part of the business world and changing his habits becomes a different kind of individual, thinking as business men think. Seeing the tasks of the season ahead, he realizes that nature in its seasonal cycles will not wait for him and so he gets onto the band wagon, ends his buyers' strike, and comes into the buying market.

This opinion of the farmer is shared largely by tractor manufacturers and subscribed to by farmers, some of whom for 40 years have been tillers of the soil, and know their fellow farmers as the business man knows his fellow business man.

The farmer, like the manufacturer, is just emerging from that great national drunk and joy ride of

money-making and luxurious spending which has spread over the country since the armistice. On awakening the morning after he is a little bewildered and requires time to collect himself.

The farmer stopped buying last fall when wheat fell from \$2.60 to \$1.50 per bushel; when corn dropped from \$1.57 to 40 cents; when wool tumbled from 75 to 20 cents per lb.; when milk sold to the condensing factories at \$3.40 for 12.5 gal. went to \$1.70 and all the condensing factories closed with the sides literally bulging out of the condensed milk storage warehouses; when cotton dropped from 30 cents to 7, and when livestock reached lower records.

This farmer is no more disgruntled than bankrupt. He is akin to the man who did not buy stock at the lower level of prices and sees himself having failed to make a good deal of money when the price rose. These farmers are poor in bookkeeping mathematics rather than in actual values. Too many of them are counting their losses based on a book value of wool at 75 cents per lb. rather than 25 cents. In calculating just how poor and psychologically bankrupt they are many are endeavoring to figure out what it has cost them to raise a bushel of corn on what they have cultivated on land worth \$400 an acre 10 months ago and to-day worth little over \$200 per acre. They are doing all of their calculating on the high level of prices to arrive at their losses.

These farmers are not bankrupt, far from it. They are in many cases short of ready cash—they did not sell wheat or corn when the market was at the top. They were badly advised in many instances by county agents who urged them to hold for \$2.00 wheat. To-day not a few of these same county agents are advising them not to buy agricultural machinery until the price comes down; even worse in some agricultural states, rumors have been spread to the effect that certain branch houses and distributors of farm machinery were refusing to sell repairs in order to force the farmer to purchase new machinery. It is scarcely necessary to state that such malicious tales have been traced down and the farmer convinced of their falsity.

Farmers Badly Advised

The farmer has been badly advised in many parts of the country. He is literally to-day a very miserable person and reminds us of the old adage, "If you wish to be miserable you must think about yourself, about what you are, what you do, what other people think of you, and then you can be as miserable as you choose." The winter months have given the farmers too much opportunity to discuss their troubles with their neighbors. They have fed each other discontent. They cannot see why wholesale prices of mercantile commodities have been reduced 64 per cent and retail prices have only fallen 14 per cent. Farm production has been cut over 40 per cent in many products during the past eight months.

The farmer is thinking financially to-day as he never did before. He is comparing the cost of farming with horse and tractor more than in the past. He is also figuring the cost of raising a bushel of wheat or corn more closely than formerly. Herein is a clue to tractor sales—a clue advised by farmers at the Columbus show, and a clue agreed to by many manufacturers.

Tractors as Production Aid

The sound method of selling tractors is on the basis of an increased yield per acre due to tractor cultivation as compared with horse cultivation, and the shorter time necessary for such. In short, it is production farming. An Illinois farmer, Francis Mann, with 42 years farming record behind him, is authority for the statement that selling a tractor on the basis of cultivating an acre of ground by tractor as compared with horse is unsound, and detrimental to the general advance of tractors. He recommends selling a tractor on the increased yield in bushels from an acre of grain and the shorter time the ground can be cultivated with tractors and the ability to do this cultivation when it produces best results. An agricultural university after investigating tractors declared that farmers with tractors in that territory were plowing the soil 2 in. deeper than with horses, and the yield was 25 per cent per acre greater. This yield was partly due to deeper plowing, and partly due to the plowing being done when the soil was benefited most by the cultivation. It is well known that statistics over a period of 20 years show that there is a greater yield of winter wheat per acre in Kansas when the land is plowed late in July or early in August than if plowed late in August or in September. In July the soil is hard and dry and the temperature 110 Fahr. It is good tractor plowing weather but impossible horse plowing weather.

Similar conditions apply in regard to other crops and in other states in varying degrees. In Illinois corn planted before May 15 invariably yields more per acre than if plowed after that date. Several Illinois farmers have declared that it is impossible for a successful

farmer to maintain enough horses to care for the spring plowing peak, and get the work done when it should be done. Here is another chapter on production farming. What is needed most for the tractor manufacturer is to largely revise tractor selling arguments to farmers and discuss the effect on soil and crop fundamentals and sell tractors on the basis of increase in production made possible by these factors. Sell the farmer tractors on a basis of ability to produce more bushels per acre at a lower cost per bushel and not on how much it costs for kerosene to plow an acre as compared with how many bushels of oats horses consume and how many pounds of hay are required to plow the same acre. To-day the farmer will not be slow to tell you that a bushel of oats is not worth more than a gallon of kerosene. You will find it a poor sales argument. The farmer must be sold the tractor as a production machine, one that does the farm work quicker than horses, does it better than it can possibly be done with horses, does the work when it should be done, giving more in return for effort expended, and permits the farmer to cultivate more land and produce a greater yield than is possible if he uses horses.

Production Per Man High on American Farms

The American farmer has a 5 to 1 advantage and greater producing value than the European farmer. In this country the average farmer cultivates 50 acres. In Europe he cultivates five acres. It is true the yield from European soil is twice that of our soil, but a little mathematics will demonstrate that even with the yield doubled our farmer cares for ten times the area of his European cousin, and with only 50 per cent yield he still is producing five times as much per person as the European. Tractor farming on a production basis is going to increase this yield, and give our farmer a still greater advantage.

In spite of what the world says our farmers have been making gains. In 1850 our farmers raised only 4.75 bushels of grain per capita. To-day they raise 9.2 bushels per capita. Improvements in farm machinery have largely contributed to this increase, but it must not be forgotten that since 1850 the agricultural valley of the Mississippi has come under the control of farming and the possibilities of production are greater there per man than in that part of the country further east cultivated in 1850. Our task is to increase still more the number of bushels per capita which the American farmer can raise. To do this it is not so much a problem of stopping the drift from the farm movement and encouraging a movement back to the farm, so much as increasing the producing capacity of the man on the farm. Those countries where agricultural population is greatest and where farming might be described as most intensive produce much less grain per person than the American farmer. Production in our factories has been stepped up by production machinery and production methods rather than by increasing the number of workers. Let us apply the same policy to agriculture.

Enormous Increase in Value of Farm Products

Some recent figures shed light on the value of the 1920 American crop and give an indication of the financial stability of the farmer. In 1920 the total value of farm products, which included grains, live stock, dairy products, cotton, wool, etc., was 100 per cent greater than the value in 1914. These figures are based not on the high price levels of July, 1920, but on the lower levels of 1921. In 1919 the total value of farm products in this country was \$19,856,000,000. In 1920 it was

\$5,000,000,000 above this. With these figures in mind and with the further fact that since 1914 the farmer has enjoyed unprecedented prosperity it is possible to arrive at a sane reason as to why the farmer will come back into the market when he completes his winter hibernation and gets busy with the work of the year.

The farmer is not being treated so severely on the price situation as he imagines. From 1913 to 1918 inclusive the price of farm machinery advanced 72 per cent. During this period the price of all other commodities sold to the farmer advanced 97 per cent. During this period the price of all farm produce sold by the farmer advanced 118 per cent. During this same period labor advanced 115 per cent, and freight rates increased 100 per cent. In his winter season of discontent the farmer has forgotten many of the advances of the last six years and has failed to get the correct perspective. He argues that the increased cost of labor was responsible for his present troubles. He should bear in mind that 60 per cent of all farm labor is tractor or horse and 40 per cent man. Investigations have also revealed that there has not been so much hired help on the farms because it was not available, except in 1920.

The Columbus Tractor Show

As a display of tractors, tractor parts, and power machinery to go with the tractor, the exposition was truly national and an unqualified success. As a national show for farmers or consumers it was not successful but merely a local show for Ohio farmers. An investigation of one bulk of 500 farmer registration cards selected at random from those received at the registration booth showed that 95 per cent of the farmers lived in Ohio.

As a national show attended by distributors and dealers it was not a success. A majority of the dealers attending were from Ohio and adjoining states. On the opening days, Monday and Tuesday, following the close of the Chicago motor car show practically all the dealers that registered at Columbus were present. From that time the dealer attendance fell off almost precipitously, indicating that perhaps a large proportion of those dealers attending were at the Chicago motor show and stopped off at Columbus on their homeward journey. It is a matter of regret that there should have been such an excellent display of tractors and parts and machinery, filling seven buildings at the fair grounds, and yet such a poor attendance of distributors and dealers both of whom are needed in the tractor field.

Chicago Ideal for National Show

You cannot hold a purely national tractor show except in Chicago or New York City. Chicago is first choice. The best time is the week of the Chicago motor show or if not then the week following. During the Chicago week there is the greatest gathering of dealers of any place during the year. Chicago has two buildings large enough to house the tractor show, the Municipal Pier, which has now been brought literally into the heart of the city by the widening of Michigan Avenue north to join Lakeshore Drive together with the new bridge construction and also by the erection of the Drake Hotel on the lake front. Dexter Pavilion in the Union Stock Yards is another possible exhibit space.

We are not going so far here when we suggest a national tractor show for New York City. New York City is the front door of the country through which a goodly part of the world enters. It is very largely our shipping door for export trade. As our export trade develops, as the bankers are determined it shall, and as our economists say it must, a tractor show in New York City would

carry an international character and bring buyers from the shores of the seven seas. New York City offers the ground for a close introduction of the tractor to financial and business interests.

It is doubtful if at any future national tractor show there will be such a representative display of many tractor components, not a few murmurings of discontent having been heard from several exhibitors at Columbus. Many of these parts and component firms did little business, and several were asking the reason why they should attend a tractor show when they do not find it necessary to attend the national motor vehicle shows. In the formative days of the motor car industry they were at the national shows but during the past ten years their representation has constantly dwindled and the motor shows have become more exhibits of motor vehicles.

Were the national tractor show held during the motor car show week in New York these parts makers from headquarters at hotels could serve the entire tractor clientele as they do the motor car and motor truck clientele at present. The tractor industry is capable of making a very comprehensive display without these parts people. The exhibit at Columbus was almost too big. It resembled some of the tractor demonstrations held two or three years ago at which 90 or 100 tractors lined up across the end of a square mile of prairie and by the time they had finished plowing you had scarcely opportunity to walk across the field and had not enough opportunity to critically observe many of the machines. Seven buildings at the Columbus Fair Ground filled with equipment was representative of our agricultural prominence but was a hard task on the visitor who wanted to spend one day at the show. A more useful display would be one of the tractors and power farm equipment compactly placed side by side in one large building. This could be accomplished in the Municipal Pier or Dexter Pavilion, Chicago. The absence of two score or more parts makers would detract very little from the value of such an exposition. Nobody can say that the value of the motor car show fell off when many parts makers withdrew years ago. Such a national show should be conducted by the National Implement & Vehicle Association. It is the proper organization and the show is one of its legitimate activities.

Industrial Use of Tractors Increases

The Columbus show furnished a good initiation into the vastly increased use of tractors in industry outside of agriculture. It amazed some tractor manufacturers to find developing fields for creeper and wheel types in road-building, lumber camps, petroleum areas, mining sections and in other industrial uses. Naturally, the creeper type is practically dominant in these fields or most of them. Holt has gone almost entirely into the industrial field. Best, from California, found an unexpectedly great industrial demand at Columbus, one that greatly exceeded the agricultural demand. It has been known for several years that Cletrac has been one of the most active in developing the industrial uses and recent sales to municipalities and industries have been witnesses of the success of the policy. The enormous road-building programs are appealing to tractor manufacturers, as are snow removal and municipal uses.

The Columbus show gave evidence of a crystallizing movement in the tractor manufacturing field. While formerly there have been upwards of 70 tractor manufacturers at the national shows, this year there were fewer than 50. A few were kept away because their tractors are more suitable for areas West of the Mississippi than

east of the Mississippi, but the majority of those absent were absent because of financial stringency. In some cases companies have arrived at the conclusion that perhaps they are not national from a distribution standpoint. This reduced attendance gave indication of a possible mortality during the next year, a movement which has been under way in the motor car field for several years.

Another trend of the industry which has assumed prominence during the past year is the widening list of models of tractors furnished by not a few of the manufacturers, following a policy adopted years ago by several of our strongest truck manufacturers. Thus J. I. Case T. M. Co. has four models which serve the needs of a farmer using from two to twelve plows.

The presence of half a dozen makes of motor trucks intended for farm use gave a new interest to the tractor show and gave proof of the purpose of many tractor manufacturers to furnish their dealers with a complete line of farm equipment. During the past year such tractor manufacturers as Case, Avery, Wallis, Rumely, Moline, Twin City, Samson and some others have developed farm trucks. These were all on exhibition with the tractors and farm equipment machinery. Two firms, Graham and Atlas, exhibited trucks only.

The majority of these trucks are of the 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$ and 2-ton sizes especially designed for farm work. Most of them are fitted with pneumatic tires, although some are not. The question was frequently raised during the show as to whether these farm trucks fitted with pneumatic tires of a size larger than 5 in. might not meet with premature destruction due to the average ruts on country roads and in farms being made by a 5-in. tire. If such were true then there would be premature destruction of tires of 7 and 8-in. section.

Dealer the Weak Link in Merchandising

The dealer is still the weakling in the chain of power farming merchandising. He does not measure up to the needs of the hour. Too often he is a poor salesman, a poor financial man, and too unfamiliar with what tractor service means or must consist of. Just at the moment he is an especially weak and inactive link in the chain. Nearly every tractor manufacturer is looking for good dealers and not a few are in search of good distributors. The old time implement dealer with his warehouse shed near the railroad depot, has, as an active tractor dealer, almost passed out. Service was too incomprehensible to him, and when tractors became numerous the factory discovered it could not through its branch houses give the service which the dealer was the logical person to give. To-day a dealer is measured by his capacity to give service, and whether he is known as an exclusive power-farm dealer, an automotive dealer, or a general dealer, the yardstick that the manufacturer must use in estimating his ability is calibrated to measure service. The dealer must have three qualifications, ability to give service, ability to sell, and ability to secure the necessary financial support.

Tractor manufacturers are still unsettled, and divided as to the field in which the best dealer is found. It is only natural that such firms as Fordson, Cletrac and Samson, originating from the motor field, should largely put the selling and maintenance in the hands of motor dealers, some of whom have given up motor car sales and launched exclusively in the tractor fields. Whether they have done this or not they bear the stamp of the motor car dealer and have his conception of service and sales. Fordson went very largely last August to the Ford dealers. Samson has swung largely to

Chevrolet, Buick and other General Motors dealers. Cletrac has many distributors from the car and truck field and for dealers they are looking for men who can qualify in service, sales and finance. In many sections they are largely automotive. The eventual dealer irrespective of what he may be called, must qualify according to the three requisites mentioned. Some tractor manufacturers are convinced that the exclusive tractor dealer is best, and cite average of sales per dealer proved their case. Others frankly admit that the dealer problem is still an unsettled one, and that they do not care from what source their dealers are recruited provided they can meet the requirements of the hour.

An Economic Commission Needed

What is needed most is that tractor manufacturers better educate their distributors and dealers on the fundamentals of tractor sales. Each distributor should know the soil conditions in his distribution area, and his dealers should be familiar with the character of soil cultivation that produces greatest yield in bushels per acre cultivated. The distributor and dealer should sell tractors on the production farm basis rather than on the relative cost of cultivating by horse or tractor. Agricultural colleges in many sections have the necessary information to enable merchandising tractors on a sound economic basis. The manufacturer should get this to the distributor and the distributor instill it into the dealer. To-day is the time when tractors must be sold on a basis of production ability. Intelligent farmers admit that while the dealer in the past has not sold them the tractor on this basis that they have purchased it on such a basis. Let us sell the tractor the easiest way. It is useless to start general propaganda to the farmers on how to buy tractors without first getting to the distributor and dealer the fundamental arguments.

The appointment of an agricultural engineering economic commission in connection with power farming might prove one of the most constructive steps that manufacturers could take. In the transition from operating a farm on an animal power basis to a mechanical power basis many considerations must be kept in mind.

As they are to-day many farms are not divided in the most suitable way for power farming. The division in the field has been arrived at on the basis of animal power farming.

Already there are some farms with too much mechanical equipment, witness a northwest farmer on 250 acres, with two tractors, two motor trucks, six stationary gas engines, one houselighting equipment and two motor boats.

It may be necessary for the farmer to erect a miniature factory with his power generator coupled to line shafting so that his belt work is concentrated, and his mechanical power furnished as efficiently as in a large factory. Our production factories with a centralized power house are recent creations. We would not mark the efficiency of a factory very high that had one power unit for each department. Yet this is what some farmers have been buying.

Closer co-operation of all those manufacturers producing machinery for the farm is necessary, so that an economic equipment of desirable machinery is obtained. That farmer is the nation's best asset who is correctly equipped with power machinery for the work to be done. If he is oversold he becomes a liability. If he is undersold he has not reached his possible production capacity. It might well be the work of an agricultural engineering economic commission to act in advisory capacity in this work and stimulate the necessary research.

An Engineer's Impressions of the Tractor Exhibit

By P. M. Heldt

SOME very good merchandising features were in evidence. The Bates Machine & Tractor Co. repeated its success at Kansas City last year. The Kansas City picture was a plowing scene, depicting a rural home for a background and a Bates Steel Mule tractor with plow on a platform laid with furrowed sod in the foreground. At Columbus, this company showed a tractor fitted with a snow plow, at work upon a snow-covered platform and in the background a painting of a rural winter landscape. A canopy was rigged up over the platform, supported a mechanism producing an artificial snow which fell in large light flakes in front of the painting, in close imitation of the real article. The picture was a pleasing one, but it did not attract as much attention as the plowing scene last year, which indicates that the farmer is concerned more with plowing than with snow removal.

Tractor chassis and power units on revolving stands were numerous. While the scheme of thus presenting a more or less complicated mechanism is excellent, it has lost somewhat as a drawing card as its adoption has been extended. The Cleveland Tractor Co. showed one of their Cletrac tractors with the chain track extended on the floor, an attendant slowly moving the tractor back and forth over the track by hand to demonstrate its easy running qualities. As at previous shows, the Heider friction tractor was again being maneuvered on a pair of planks on the floor, to demonstrate the ease of its control.

At the stand of the Allis-Chalmers Company, where three models of tractor were exhibited, demonstrations of the quick demountability of the engine were given at different hours of the day and always caused a considerable crowd to collect. The engine was placed on a stand on an elevated platform for the purpose, and the demonstration could be readily followed from some distance.

At the International Harvester Co.'s stand there were service booths at which instruction on ignition service and on the lubrication of the concern's tractors was given for the benefit of dealers and service men.

Moving Exhibits

Many of the exhibitors had tractors mounted on elevated platforms so that they could be conveniently inspected by visitors. Most of these show specimens—for they were specially finished in almost every case—were being turned over by electric motors, so as to help the salesmen in explaining their operation.

The most notable of the new designs were models brought out to extend or complete an existing line. This applies to the new Hart-Parr, Case, Twin City, Bates, Allis-Chalmers and LaCrosse. These new tractors in almost every instance embody all the features of previous models of the respective makers, and are merely reductions or magnifications of these earlier models.

Three Foreign Tractors

Three foreign tractors, the Somua, Fiat and Renault, were exhibited for the first time in this country, but are not new to readers of AUTOMOTIVE INDUSTRIES, as all of them have been illustrated and described in our columns. The Huber Mfg. Co. exhibited the Huber "Super Four" in addition to the Huber Light Four, manufactured for several years, the principal change in the new over the older model being that the former has a Midwest engine.

A tractor exhibited for the first time, and also quite out of the ordinary in several respects, is the Hicks, which is to be manufactured by the Hicks-Parrett Tractor Com-

pany—a recent merger of the Hicks Tractor Company of Milwaukee and the Parrett Tractor Co. of Chicago Heights, Ill. The company will be located at Chicago Heights and will continue the Parrett tractor in addition to the new Hicks.

Another new model so far as visitors to the national tractor shows are concerned was the Once Over Tiller made in Minneapolis. This machine, which combines a tractor with a plow and a pair of revolving soil millers or pulverizers, was developed by the Scientific Farm Implement Company. The Somua French tractors were shown in two sizes, one corresponding in power to an ordinary three plow tractor and the other to a garden tractor, the latter being of the soil miller type. It carries at the rear a drum which carries a number of prongs of spring steel and is rotated at a rapid rate by a positive drive from the transmission of the tractor. The drum can be raised and lowered at will and it is claimed that the soil can be loosened to a depth of 10 inches, if desired.

New Garden Tractors

Many of new models were to be seen in the garden tractor class. There are some machines made now which take the place of the ordinary hand cultivating tools often used in the home garden. These are very similar in appearance to the hand-operated cultivator, comprising a single wheel, a pair of handles, cultivating tools suitably connected to the frame of the implement and a small gasoline engine set on the frame and geared to the single driving wheel. As human muscular power is the most expensive form of power in common use, these little machines should prove highly economical wherever there is sufficient work for them to do.

An inspection of the show with respect to mechanical tendencies and developments does not convey the impression that the experimental departments of the tractor manufacturers were very active last year. It is, of course, generally known that sales have not been brisk lately, and the general impression is that considerable stocks of completed tractors have accumulated, which must, of course, be disposed of before anything new can be brought to the attention of the public. On the other hand, several of the leading manufacturers have well-developed, standardized lines and are hardly likely to upset their manufacturing routine by radical changes in design.

The changes in existing models which have been made and entirely new models brought out, point to the conclusion that the automobile type of construction will prevail; that is, the tractor with a four-cylinder engine, cut gearing, enclosed drive, anti-friction bearings and divided axle steering.

Anti-friction bearings are coming into extensive use even on the older style of tractors, and one of the most frequently heard sales argument for a tractor is that it contains so many ball and roller bearings. To judge by present tendencies, it will not be many years before it will be impossible to sell a tractor of two-plow size or over that does not have ball or roller bearings throughout except in the engine. It is therefore no wonder that the anti-friction bearing industry has become a powerful factor in the tractor industry, ball and roller bearing manufacturers being very conspicuous at the tractor shows and demonstrations.

It seemed last year at Kansas City that henceforth farm light outfits would form an important part of the tractor

show, but this year there was a decided retrogression in the representation of farm lighting sets, only three or four of the seventy or more sets on the market being shown. None of the farm lighting manufacturers allied with some of the big tractor makers, like the Sunnyside Electric Co., the Domestic Engineering Co., and the Willys-Overland Co. exhibited. Whether this is due to non-solicitation by the show management or to a conviction that people who attend the show are interested primarily in farm tractors and not in lighting sets, is an open question. Owing to the slight competition and the large farmer attendance, the few makers of lighting sets which were represented should reap excellent results from the show.

There was again an excellent line of stock engines for tractors shown, including the Waukesha, Wisconsin, Hercules, W-S-M, Weidely, Climax, Stearns and Midwest. The LeRoi Co. had space at the show, but owing to delays in transportation no exhibits were on hand. While there was thus quite a variety in engines from which the tractor builder might make his selection, there was this year only a single transmission exhibit, that of the Nuttall Gear Company. Among the parts exhibitors, manufacturers of carburetors and ignition appliances were prominent.

Ignition appliances in connection with tractors means, of course, magnetos. Reference was made above to merchandising features in connection with complete tractors, and something should be said of merchandising features in connection with parts. In this respect the magneto manufacturers were easily the leaders among parts exhibitors. Several showed magnetos in operation under glass domes with a current of fine dust or a spray of water constantly playing on the magneto, to demonstrate its dust-proof and water-proof qualities. The K-W Magneto Company demonstrated two magnetos from which two of the magnets had been removed, being turned over slowly by means which were not apparent to the eye. One of the magnetos was suspended from tubular posts by two chains and the other was mounted on a platform resting on a tubular post,

which latter was sectioned to show that there were no wires running up inside. No wire connections could be seen on the outside, yet the magnetos kept turning at a slow, uniform rate and generating sparks, and the method of driving them was the cause of considerable speculation among technical men.

Final Drive Tendencies

In final drives there seems to be an increasing tendency to use a worm and wheel for the first reduction and a spur on internal pinion and wheel for the second. Among others, the new Farquhar has this form of drive. It combines the advantage of simplicity with efficiency, owing to the favorable working conditions, as the worm need not be subjected to excessive tooth pressures.

In the new Uncle Sam 12-20 model both the transmission and the final drive are by roller chains. The chains being completely enclosed and running in oil, the conditions of operation are, of course, much better than when exposed chains are used. Owing to there being two chain drives in tandem, and also two in parallel, it is quite difficult to provide means of adjustment, and none are provided in this case. The familiar "stretching" of exposed chains, which calls for frequent adjustments, is due to wear of the links, and in order to minimize this, unusually large chains are used. This experiment of introducing enclosed chains running in oil for tractor drives will be watched with interest by tractor engineers. The enclosed chain has not proven very satisfactory on motor trucks, but it must be remembered that on a motor truck it is much more difficult to enclose a chain, owing to the fact that spring play must be provided for.

Moving pictures showing tractors doing various kinds of work were another of the show attractions. One film illustrated the use of the Holt Caterpillar in logging work in Oregon and proved of great interest to the visitors, most of whom evidently were entirely unfamiliar with this class of work. The room in which the pictures were shown was entirely too small to take care of the crowds.

Descriptions of New Tractors Exhibited

Case 40-72

The J. I. Case Threshing Machine Co. showed for the first time a 40-72 hp. tractor on modern lines, and now has revised its whole line, which consists of four models. The new 40-72 hp. machine follows the other Case designs in having all the transmission shafts parallel with the engine crankshaft, and using open gears only for the transmission of power to the rear axle. All other gears are inclosed and run in an oil bath, which is a new feature for a tractor of this size. Engine, transmission and rear axle housing are separate units, which are bolted down to the channel steel frame by means of turned bolts. The frame consists of 8-in. and 10-in. channels, hot riveted. At the point of greatest strain the 8-in. channel is carried underneath the 10-in. channel, the two being reinforced by a $\frac{3}{8}$ -in. plate 18 in. deep, which is riveted to both. The 8-in. channels are extended to carry the platform and wheel guards.

The four-cylinder engine has 7 x 8-in. cylinders and runs at a governed speed of 750 r.p.m. Operating on kerosene it develops a maximum output of 90 hp. Two speeds are provided, 2.07 and 3 m.p.h. Characteristic of the robust construction is the 4-in. crankshaft, which has 4 x $4\frac{1}{4}$ -in. crankpin bearings and main bearings of the following dimensions—4 x $7\frac{3}{8}$ in. next to the belt pulley, 4 x $5\frac{3}{8}$ in. at the opposite end and 4 x $5\frac{1}{2}$ in. at

the center. The length of the pistons is 9 in. The piston pin bearings measure 2 x $3\frac{1}{2}$ in. Valves are $2\frac{3}{4}$ in. in diameter and have a lift of $\frac{1}{2}$ in. Connecting rods are 17 in. long or more than twice the length of the stroke. The camshaft has a bearing diameter of $2\frac{1}{4}$ in. and the total length of its three bearings is $13\frac{1}{2}$ in. The width of the cam face is $1\frac{1}{8}$ in.

Pressure lubrication is employed, the oil being forced directly to the main bearings, camshaft bearings and crankpin bearings. A gear type of pump furnishes the pressure; it is driven by helical gears from the camshaft and is submerged in oil in a depression of the oil pan. The crankshaft is drilled for oil feed to the crankpins. An adjustable relief valve is provided, as well as an oil pressure gage, which latter is located in direct view from the driver's seat. A four-lead pump delivers fresh oil to the cylinder barrels at all times. A circumferential groove is cut in the cylinder liners so that the oil thus fed will be distributed all around the cylinders.

The belt pulley is mounted directly on the crankshaft. It measures $19\frac{1}{2}$ in. in diameter by 10 in. width of face. A double disk type of clutch is fitted and serves to control both the belt power and the driving power.

The cylinders are cast in pairs and are fitted with renewable liners. Each pair of cylinders has a separate removable head casting. These head castings contain the

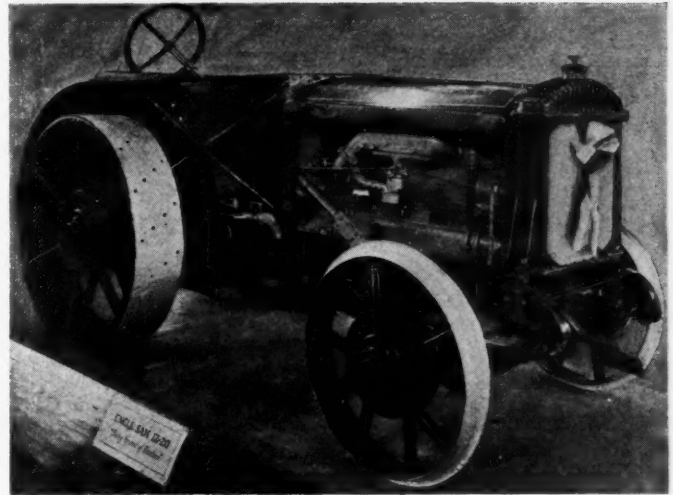
valves and the spark plug holes. A truck type of radiator, without soldered joints in the tanks, is fitted. Behind the radiator is a gear-driven fan in a fan shroud. The centrifugal water circulating pump is located in an accessible position. The differential gear is of the spur type, which is claimed to possess decided advantages for large powers, as it develops no side thrust and no thrust bearings are required in the differential. The differential is mounted on the bull pinion shaft, which is $3\frac{1}{2}$ in. in diameter at the bearings, each shaft being supported by two Hyatt heavy duty bearings. The bull gears are 42 in. in diameter by 4 in. face and have cut and hardened teeth of $1\frac{3}{4}$ in. diametral pitch. These gears are inclosed in dust proof housings.

The rear wheels are 72 in. in diameter and 20 in. wide and are mounted on a 4-in. live axle rolled of special stock. This axle is carried in two Hyatt roller bearings. The front wheels are 48 x 10 in. and are mounted on Timken roller bearings. The Case 40-72 Tractor has a wheelbase of 124 in., an overall length of 200 in., a width of 105 in., a height of 110 in. and weighs 21,200 lb.

Once-Over Tiller

The Once-Over Tiller is a new form of farm implement that prepares a seed bed in one operation. It combines a tractor with a pair of plow bottoms and a pair of revolving implements, one at the side of each plow bottom, which break up or pulverize the soil as it is being turned over. The concern making this machine was formerly known as the Scientific Farm Implement Co., but in June, 1920, was reorganized as the Once Over Tiller Corp. The machine somewhat resembles the motor plows made in several European countries, in that the plow is combined directly with the tractor. There are two front driving wheels and one rear trailing wheel, and the engine overhangs the front wheels a considerable distance. The power plant consists of a Stearns four-cylinder $4\frac{1}{2}$ x 6-in. engine, the equipment including a $1\frac{1}{4}$ -in. Stromberg carbureter and a Splitdorf magneto with impulse starter. The transmission is of the company's own design and manufacture and is of the sliding gear type, giving three forward speeds and one reverse. The three forward speeds are $1\frac{3}{4}$, $2\frac{1}{2}$ and 4 m.p.h., the intermediate speed being the plowing speed. All gears are cut and heat-treated, are inclosed and run in a bath of oil. The final drive is through internal gears, which are also inclosed. Both ball and roller bearings are used in the transmission and on the axle. The differential gear can be locked when desired.

The rotors on which the tilling knives are carried are driven from the tractor engine through a separate clutch and a pair of universal joints. The tiller gears are cut from carbon steel, case hardened and inclosed in an



Uncle Sam 12-20 tractor

oil-tight case. The shafts of these gears are mounted on Hyatt heavy duty bearings. The knives of the rotor are made of crucible steel; a spring arrangement is provided which allows large stones to pass the knives without damaging the machine. A standard two-bottom Vulcan gang plow is used. It is lifted by a special mechanism, which is operated by the power of the engine directly instead of through the plow wheel. This makes the lifting mechanism positive.

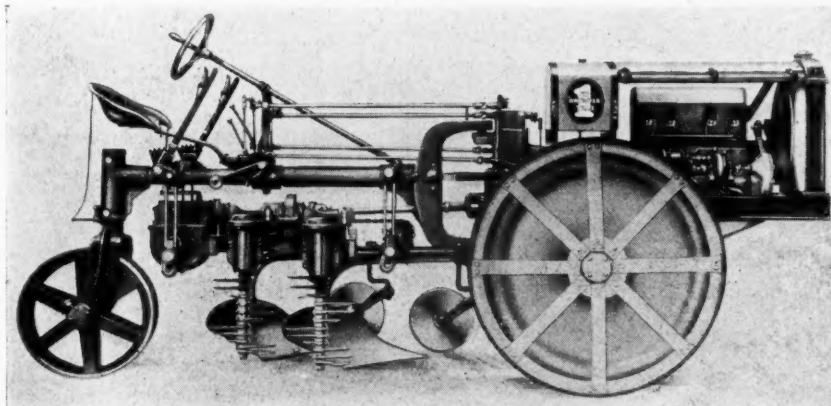
Steering the Once-Over Tiller

Steering is by a rack and pinion mechanism and the driver's seat and controls are mounted on the tube extending back from the steering yoke. All controls of both the tractor and the plow are within easy reach of the operator. Ordinarily steering is accomplished by means of the hand wheel, which swings the driving wheels to one side or the other relative to the rear structure. But when it is desired to make a specially short turn, the operator can make the rear wheel a caster wheel by pulling a trip, and then by applying a brake to the front wheel on the side to which he wants to turn, he can make the machine turn on its own axis, it is claimed.

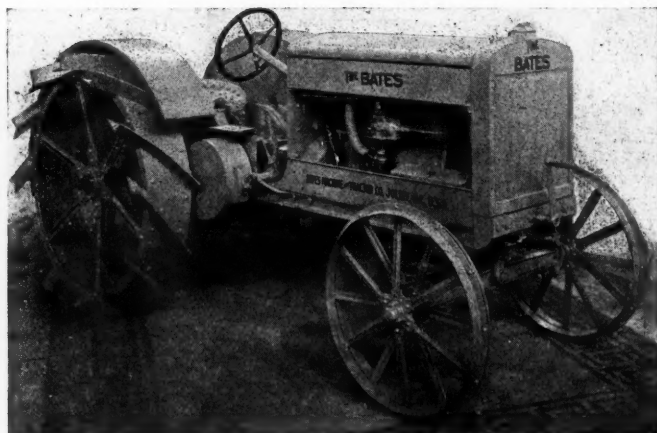
Following are some of the more important dimensions of the machine: Wheelbase, 116 in.; overall length, including plows, 196 in.; total width, 65 in.; total height, 75 in.; minimum ground clearance, 24 in.; drive wheel dimensions, 54 x 10 in.; belt pulley dimensions, 13 in. diameter by 7 in. width of face. The belt pulley is driven at 900 r.p.m. and is controlled by a Twin Disk clutch.

U. S. 12-20 Model

The U. S. Tractor & Machinery Co., which heretofore has specialized on its 20-30 tractor, has added a 12-20 model which embodies quite a number of features not found in the 20-30. It is an assembled machine in so far as it has a stock engine, but the transmission is of special design and is made by the U. S. company itself. The engine is a Weidely and is mounted at the front in the usual way. Cylinder dimensions are $4 \times 5\frac{1}{2}$ in., and the governed speed is 1200 r.p.m. A Bennet air cleaner and carburetor are fitted and ignition is by a Splitdorf magneto with impulse starter. The transmission is by a pair of bevel gears to a first



Once Over tiller

*Bates wheel tractor*

cross shaft, then by one or the other of two roller chains to a second counter shaft and then by another roller chain to the rear axle. The entire transmission is inclosed in a cast iron case and runs in an oil bath, and it is claimed that, owing to the fact that the chains are always well lubricated and protected from dust, they do not wear and stretch. Timken roller bearings are used throughout the drive and on the front axle as well. The front axle is of the automobile type and carries the frame on a semi-elliptic spring. The frame is built up of 4-in. steel channels. The belt pulley, which is located in a convenient position ahead of the drive wheel, is 14 in. in diameter and has a 6 in. face. It is equipped with a separate clutch and can be run in either direction. One of the features of equipment is a bucket seat similar to that furnished on the Uncle Sam 20-30. The machine is rated to pull two plows under all conditions and weighs 3000 lbs. Its two forward speeds are $2\frac{1}{2}$ and $3\frac{1}{2}$ m.p.h. The drive wheels measure 45 x 10 in. and the front wheels, 34 x 5 in.

Bates Wheel Tractor

The Bates Machine & Tractor Co. has added to its line a wheel tractor. The new model is identical with the older one from the front back to the rear axle. The Bates company has adopted the Midwest engine. The rating is 15-25 hp. engine, clutch housing and transmission are bolted rigidly together, forming one solid block which is mounted on roller-bearing axles. The transmission affords two forward speeds, $2\frac{1}{3}$ and $3\frac{1}{2}$ m.p.h. The drive wheels are 48 x 10 in. and the front wheels 30 x $4\frac{1}{2}$ in. The over all dimensions are: Length, 131 in.; width, 63 in.; height, 60 in. The tractor complete weighs 4000 lb. One clutch operates both the tractor and belt pulley and is controlled by a hand lever. This pulley is 16 x $6\frac{1}{2}$ in. and gives a belt speed of 2450 ft. per min. All bearings of the transmission and axles are Timken. All gears are machine cut and run in oil. Although the engine and transmission case are bolted together, the frame is not dispensed with.

Hart-Parr 20

Heretofore the Hart-Parr Co. has had only a single model of 30 belt hp. rating. Now a 20 hp. model has been added. This is a replica of the earlier model on a smaller scale. The two cylinder engine has a bore of $5\frac{1}{4}$ in. and a stroke of $6\frac{1}{2}$ in. and the tractor is rated to pull two 14 in. bottoms.

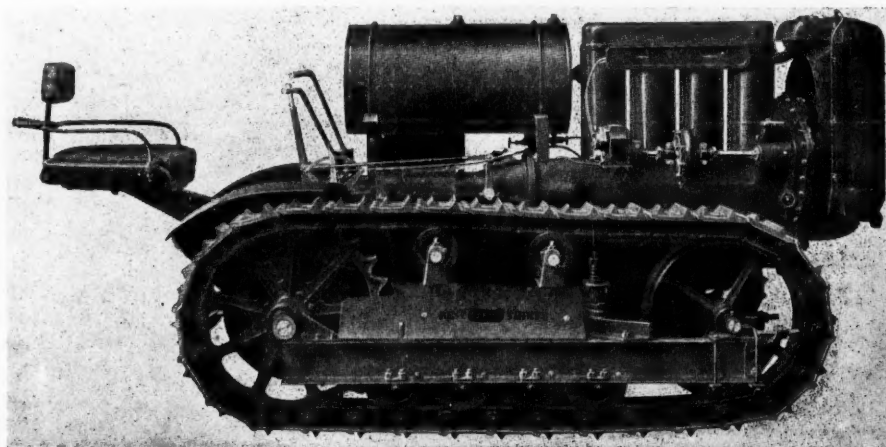
Both cylinders are in one casting and the valves are in the head. The crankshaft main bearings are $2\frac{1}{2}$ x 4 in. and the connecting rod bearings, $2\frac{1}{2}$ x $2\frac{3}{4}$ in. Lubrication is by a mechanical oiler with six leads. A float feed carburetor in combination with the Hart-Parr shunt is used, and the tractor is designed for operation on kerosene. Ignition is by high tension magneto with impulse starter. The clutch is a Hart-Parr contracting band type and the transmission is of the selective sliding gear type furnishing two forward speeds, 2 and 3 m.p.h. All transmission shafts run on ball bearings. The drive wheels are 46 x 10 in. and the front wheels, 28 x 5 in. The frame consists of a single steel casting which is heat-treated. The machine measures 120 in. in length over all and 66 in. in width, has a tread of 62 in. (measured from outside to outside of wheels) and a shipping weight of 3500 lb.

Best 30 Track-layer

A very modern looking type of track-layer tractor is the Best 30 of which the first machine completed was exhibited, according to report. Engine, clutch housing and transmission are bolted together into one unit which is spring-supported on the track-layer frame not far from its center of gravity, so that nearly the whole weight is sprung. The engine is a Best four-cylinder, valve in head type with separately cast cylinders and a single removable head casting. The cylinder dimensions are $4\frac{3}{4}$ x $6\frac{1}{2}$ in. An inclosed centrifugal governor is fitted and governs the engine at 800 r.p.m. Lubrication is by pressure from a gear pump. The Ensign gasoline carburetor is fitted and ignition is by high tension magneto. The piston pins are floating. The crankshaft is $2\frac{5}{8}$ in. in diameter and the camshaft, $1\frac{1}{4}$ in. The cooling fan is gear-driven through a friction clutch.

Steering is effected by applying power to one truck only by means of a large multiple disk clutch operated by long levers extending transversely across the frame. The trucks are spring-mounted, each oscillating independently of the other. Hardened steel rollers mounted on roller bearings carry the tractor. The track center distance is $41\frac{3}{4}$ in., the standard equipment consisting of $11\frac{1}{2}$ in. shoes with a track length of 61 in. The track links are drop-forged and heat-treated. A double flanged front idler contacts with the spools of the track. The final drive is through $3\frac{1}{2}$ per cent nickel steel, cut and hardened gears which are inclosed and operate in oil.

The total length of this tractor is 112 in., the height to the top of the radiator, 59 in.; the over all width, $53\frac{1}{4}$ in., and the width inside the tracks, $30\frac{1}{4}$ in. The ground clearance is $11\frac{1}{2}$ in., the draw bar height, $16\frac{1}{2}$ in. and

*Best "30" tracklayer tractor*

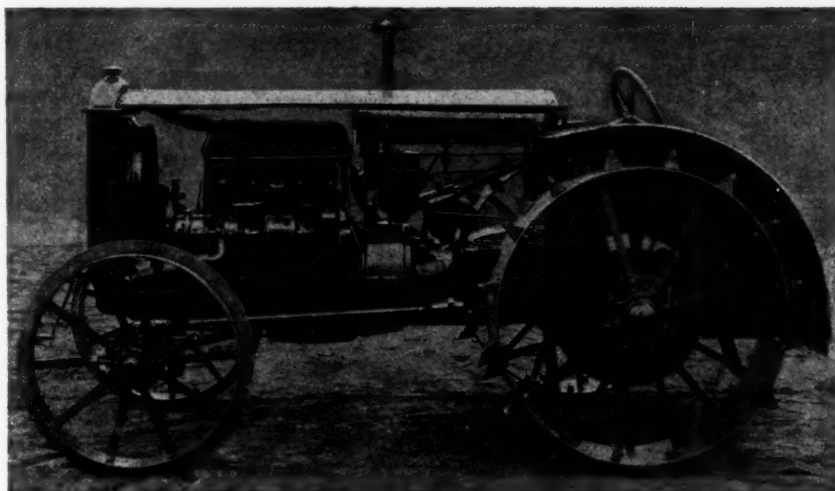
the ground pressure, 5.2 lb. per square inch. A 12 x 7 in. pulley is provided, which at 800 r.p.m. gives a belt speed of 2513 ft. p.m. The tractor carries 28 gal. of fuel (either gasoline or distillate, though kerosene equipment can be furnished as an extra). The weight of the tractor is 7400 lb. An upholstered seat with spring-supported, upholstered backrest is an attractive feature of this machine.

Allis-Chalmers 12-20

The Allis-Chalmers Co., which heretofore has been manufacturing a four-plow 18-30 and a single plow 6-12 model, has just added an intermediate size having a 12-20 rating. This machine is of the frameless type and is, of course, completely manufactured by the Allis-Chalmers Co. This concern has evidently decided to get out a full line of farm tractors and become an important factor in the tractor field. At the show a demonstration was given several times a day of the rapidity with which the Allis-Chalmers engine can be taken apart and reassembled, the former operation requiring 10 min. and the latter 15 min., more or less. Needless to say, the two mechanics making the demonstration worked rather harder than the average garage mechanic doing work on an hourly charge basis, and seemed to be about "all in" after the demonstration.

The new tractor model has a four-cylinder engine of 4½ in. bore and 5¼ in. stroke, governed to 1100 r.p.m. by an inclosed centrifugal governor. The engine is designed to run on gasoline and a supply of 20 gal. is carried in a tank over the transmission. A siphon type air washer cleans the air before it enters the carburetor. Fuel is fed to the carburetor by gravity. Lubrication is by pressure. The clutch is an expanding type and the transmission gives two forward speeds and one reverse. These speeds are 2½ and 3¼ m.p.h. The final drive is by inclosed internal gears, and a non-locking differential is fitted.

The belt pulley measures 12½ in. in diameter by 6½ in. face and the belt speed is 3250 ft. p.m. The same clutch that is used for driving controls the belt power. A brake is provided to act on the belt pulley. Following

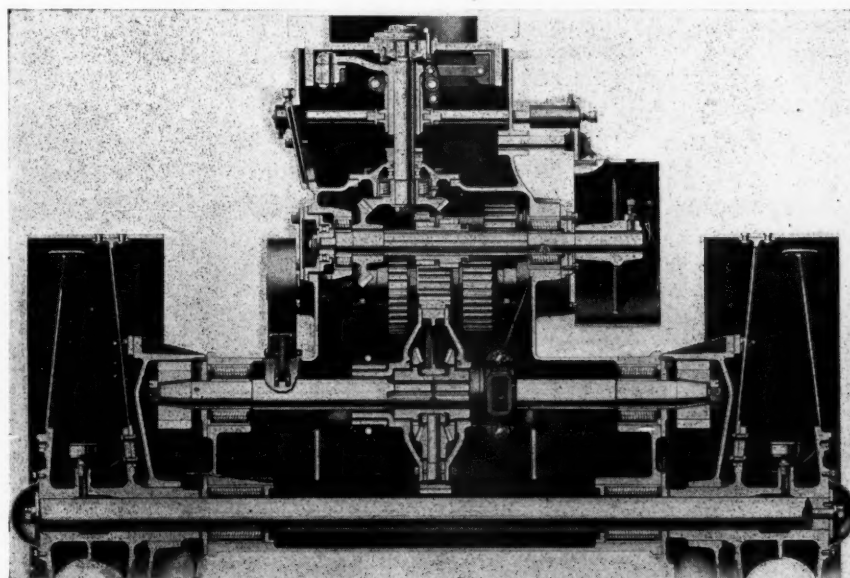


Allis-Chalmers 12-20 tractor

are some of the more important dimensions of this tractor: Total length, 135 in.; total width, 66 in.; total height, 60 in.; wheel base, 78 in.; minimum ground clearance, 13 in. The net weight of the tractor is 4400 lb. The clutch is operated by a hand lever at the driver's left and the brake pedal is located adjacent to this lever. The front axle is in the form of a casting of hollow section and is pivoted to the engine crankcase at the front, the gear case cover being extended to form a yoke for the axle. Radius rods extend from the ends of the front axle to a balance lever at the forward side of the fly-wheel bell housing. A spring keeps the fan belt automatically under tension. One-half of the bell housing is cast with the lower and one-half with the upper part of the crankcase. A bracket mounted on the transmission housing supports the steering column and the control levers.

Boring Convertible Tractor

The Boring tractor is somewhat different from the ordinary run of tractors in that it is a combination tractor and cultivator having a ground clearance sufficient to permit it to pass over corn 35 in. high, and having an adjustable wheel extension which will permit the machine to span two rows of corn. As a tractor the machine pulls three plows. It is of the three-wheel type having its two driving wheels at the front and a caster wheel used for steering located at the rear. When plowing and cultivating the implements are always in front of the operator, being located between the front and rear wheels. By means of the frame extension the wheel tread can be varied, from a minimum of 54 in. to a maximum of 79 in. This is accomplished by turning a crank located on the front cross member of the frame. The rear caster wheel is operated by a conventional steering gear enabling the tractor to be turned in a radius of 7 ft. The drive wheels are 54 in. in diameter and are 10 in. wide. The power plant consists of a four-cylinder 4¾ x 5¾ in. Waukesha engine. This engine has a hollow crankshaft for force feed lubrication. The transmission has two speeds forward and one reverse. The high gear gives a normal plowing speed of 3½ miles per hour. A Bennett carburetor is fitted and it is claimed that



Transmission and rear axle of Allis-Chalmers 12-20



Boring convertible tractor-cultivator

the tractor can be run on either gasoline or kerosene. A Bennett air cleaner is used, this being of the centrifugal type. The power take-off is on the right side of the tractor and on the outside of the frame. It is independent of the engine clutch and the pulley turns only when the belt power clutch is engaged. Its speed is 41/100 that of the engine. The tractor weighs 3400 lb. and of this weight 3000 lb. rests on the front drivers and 400 lb. on the rear caster wheel.

Farquhar Three-Plow Tractor

A. B. Farquhar, the implement maker, this year exhibited a four-wheel tractor rated as a three-plow job of 15-25 hp. The tractor is assembled from well known units including a Buda engine. The drive is through an intermediate shaft to the transmission, which is located over and slightly back of the rear wheel axis. The tractor is steered and operated in the conventional way. The final drive to the rear wheels is through completely inclosed spur gears. The power plant of this tractor is a four-cylinder $4\frac{1}{2} \times 6$ in. Buda engine located longitudinally. A K-W magneto is used for ignition. The carburetor is of Kingston make and two fuel tanks are provided, one for 5 gal. of gasoline and the other for 25 gal. of kerosene. An air preheater is located back of the engine just over the bell housing. Engine speed is controlled by a Pierce governor, operating normally at 900 r.p.m. A Borg & Beck clutch is located within the fly-wheel housing and is completely inclosed. A short shaft driving through two Hartford universals connects to the Timken-David-Brown worm gear first reduction. Two forward speeds are provided through sliding gears. These gears, together with the worm and worm wheel, all operate in an air tight oil bath. The cross shaft of the transmission is fitted with pinions meshing with drive wheel bull gears.

Steering is by a worm and wheel mechanism. The spark and throttle levers are located on the steering post center. The belt pulley is accessible from the driver's seat, and is driven by a chain. The driving wheels are covered with large fenders and no moving parts are within reach of the driver's feet. The tractor weighs 5700 lb. Its overall length is 162 in.; its width, 67 in. The wheel base is 83 in. and the ground clearance, 12 in.

The Hicks Crawler Tractor

The Hicks is of the combined wheel and crawler type, having two

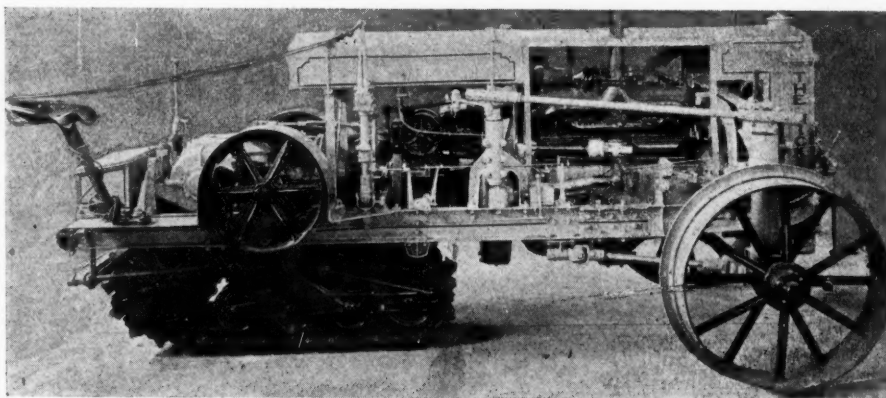
front wheels for steering and two chain tracks at the rear for driving. The engine is a Buda four cylinder $5 \times 6\frac{1}{2}$ in. running at 800-900 r.p.m. Either gasoline or kerosene can be used as fuel. Fuel feed is by gravity, and ignition by a high tension magneto with impulse starter coupling. Engine speed is controlled by a fly-ball governor. A radiator of the built-up type is located at the forward end of the tractor. The transmission is of novel design, it is claimed, comprising cut gears of alloy steel whose shafts are mounted on annular ball bearings. All of the gears remain in mesh constantly and operate in an oil bath. Two forward speeds may be had, namely, 2.4 and 3.4 m.p.h. There are two chain tracks which are centrally located and are flexible in a vertical direction to allow for unevenness of the ground. These chain tracks are driven through a centrally located drive gear, both track sprockets being keyed to the drive gear shaft.

One of the most interesting features of this tractor is its steering mechanism. Steering is effected by engine power through a set of three bevel gears. The driven bevel gears are loose on their shaft but can be made to turn therewith by means of two cone clutches. These clutches are controlled by means of the driving lines. In order to start the tractor when the gear is in the neutral position, the driver gives a slight jerk on both lines. A pull on either of the lines turns the front wheels. There are two belt pulleys, one on each side of the tractor. These pulleys are controlled by expanding clutches. The overall dimensions of this tractor are as follows: Length, 132 in.; width, 78 in.; height, 72 in. The tractor complete weighs 7850 lb.

La Crosse Line-Drive Tractor

A small tractor with the line drive feature was shown by the La Crosse Tractor Co. This model has a 6-12 hp. rating and weighs in the neighborhood of 3000 lb. It will pull two bottoms, and the manufacturers figure that it will take the place of five horses under average horse working conditions. It has been hooked up with practically all implements that horses now handle, and one of the selling arguments put forward by the manufacturers is that it is not necessary with this tractor for the farmer to buy special equipment. In addition to the line drive this tractor has friction drive, which, however, is not of the disk and wheel type but consists of a friction roller which is adapted to engage with either of two concentric friction drums, one giving a forward speed and the other the reverse.

The engine has two horizontal cylinders of 4 in. bore and 6 in. stroke. It has two ball bearings on the crankshaft and reinforced die-cast bearings on the crank pins. The valves are located in the cylinder heads and are in-



Hicks tractor with power steering

closed. The front wheels turn on steering knuckles operated by the lines. Differential brakes are automatically applied by the steering mechanism and the applying mechanism can be adjusted to put these brakes on when the steering wheels have been swung around

through any desired angle. There are only two speed reductions from the engine crankshaft, first through the friction wheel and drum and then through a lantern wheel and internal gear. The latter is cast in eight sections.

Some New Garden Tractors Exhibited

THE Spry Wheel, made by H. C. Dodge, Inc., is a single wheel tractor and cultivator combined. It has a frame 37½ in. long and 7 in. wide, with side members of pressed steel, on which is carried the single cylinder two-stroke air-cooled engine. The cylinder of this engine is cast with cooling flanges and is heat treated before the final grinding at a temperature of 1150 deg. Fahr., so that it will not warp after being finished. Two flywheels of semi-steel are keyed to the crankshafts, the crankpin being secured into their webs to make a built-up crankshaft. The piston, which is 2½ in. in diameter, is provided with three rings. A vaporizer is used instead of a carburetor, and ignition is either by a Bosch high tension magneto or a non-vibrating coil and three dry cells. The transmission is through a chain to the intermediate shaft and thence through a pinion and internal gear to the single 20 x 3½ in. drive wheel. There are two adjustable cast wheels toward the rear of the frame, and the tool carrying equipment, which is adjustable for various depths of cultivation, is suspended directly behind these wheels. The handles are bolted to the frame just forward of the drive wheel axis, and the one-gallon fuel tank is carried on them. The spark advance lever and ignition switch are located at the curve of the handles, and it is claimed that with these control devices alone a speed variation from 1½ to 4 m.p.h. can be obtained. The standard tool equipment consists of a 12 in. rear tool holder with adapter plates by means of which the tool spread can be extended to 18 in.

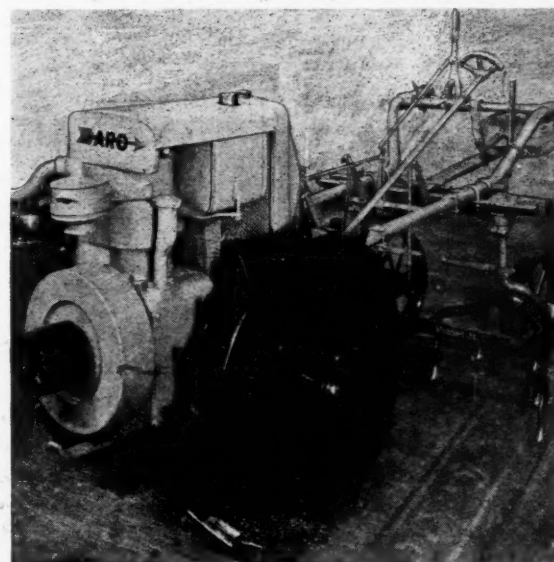
The Aro tractor is a machine designed to do any kind of one-horse job. Unlike most of the smaller machines so far made, it is a riding tractor. The power plant consists of a single cylinder 4½ x 5 in. engine running normally at 800 r.p.m. The crankshaft is 2 in. in diameter and is mounted in Hess-Bright ball bearings. The connecting rod bearing is 2¼ in. in diameter by 3 in. in length. Gasoline is used as fuel and a supply of 2 gal. is carried in the tank. Fuel feed is by gravity to the Schebler carburetor and ignition is by a high tension magneto. Lubrication is by splash, with circulation by a plunger pump, and the cooling water is circulated by thermo-siphon action. The flywheel is mounted at the front of the engines. A shoe type of expanding clutch is fitted. The belt pulley is on the flywheel and is 6 in. in diameter by 4½ in. wide. Transmission is through a worm and wheel, giving a single reduction between the engine crankshaft and the driving wheels. Worm and wheel are enclosed in an oil-tight case. The drive wheels are of the disk type, 30 in. in diameter by 4 in. wide. The width of tread can be adjusted. There are two 16 in. caster wheels at the rear. This tractor is 106 in. long over all, and 45 in. high; it weighs 1,000 lbs. and is rated as a 3-5 hp. machine. Its speed can be controlled between limits of 1 and 3 m.p.h., and it is capable of pulling one 10 in. plow. The minimum ground clearance is 10 in., but under the axle the clearance is 12½ in. The operator steers the machine with his feet; he controls its speed with the throttle lever, and all movements of the tool are controlled with one lift lever. It is claimed for the Aro that with a 10 in. plow it will turn a full-width furrow of good depth under all soil conditions, operate disks, harrows or other seed bed tools and do a thorough job of cultivating

any wide row crop, being readily adjustable to different row spacings.

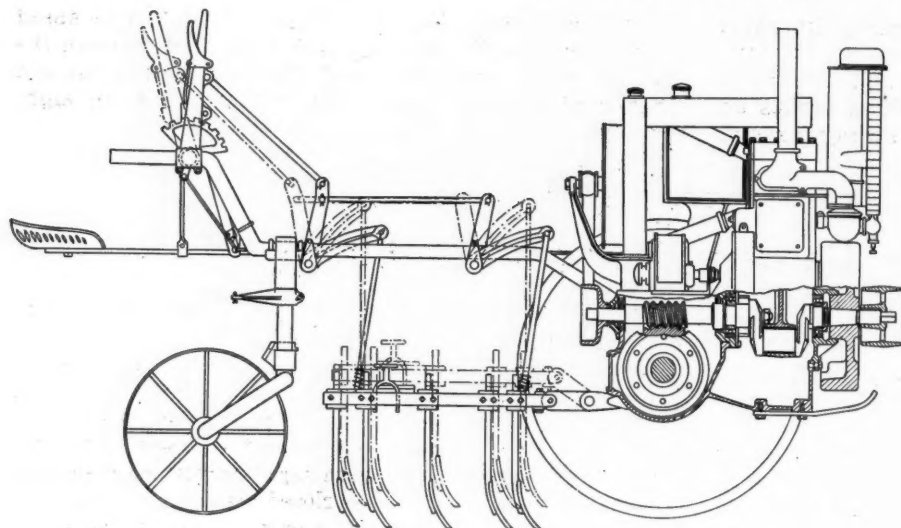
Another garden tractor shown for the first time is the Centaur manufactured by the Central Tractor Co. This has a single cylinder, vertical, air-cooled engine rated at 5 hp. Cooling is effected by means of a blower in the flywheel. Ignition is by a Bosch high tension magneto and lubrication by splash in the enclosed crankcase. The drive is through a pair of bevel and a pair of spurcut gears to a countershaft and thence through an enclosed chain to the driving axle. A differential gear is fitted on the axle, to make steering easy. The driving wheels are 28 in. in diameter by 4 in. in width and are spaced 25 in. center distance. The over-all height is 38 in. and the axle clearance 12 in. For plowing or for use on wet or sandy soil wheel extensions increasing the width of the drive wheel to 8 in. can be applied. The machine is started and stopped by means of a multiple disk clutch and its speed is controllable between the limits of 1½ and 3 m.p.h. There is a belt pulley on an extension of the crankshaft for such work as pumping, grinding and line shaft driving.

The Gromor cultivator was exhibited by the Frank Held Tractor Co. This machine has a single cylinder, vertical, air-cooled engine with an integral reduction gear of 8 to 1. From the engine shaft there is a chain drive to a countershaft with a reduction of 2 to 1 and then comes a final drive by gears with a reduction of 4½ to 1. This gives a total reduction of 72 to 1 and should make the machine sufficiently powerful to cope with all soil conditions. For cooling the engine, a four-blade open fan is mounted at the side of the cylinder driven by belt. Among the claims made for this cultivator are that it has a low center of gravity and sufficient clearance to make operation easy. Drive wheel, motor supports and bearings are of gray iron, while all other parts are of soft steel, cast steel or manganese bronze.

A number of changes in design have been made in the



Aro, one of the riding garden tractors



Sectional view of Aro tractor

Utilitor tractor whereby the power of the engine has been materially increased. The engine has been retimed and the valve lift increased 1-16 in. At the same time the inlet manifold was enlarged so as to give the gases a freer en-

trance into the cylinder. The shape of the combustion chamber has been changed somewhat and the compression raised 10 lb. p. sq. in. Removable valve stem guides and a variable speed governor are now employed. The magneto drive has been improved and the location of the spark plug so changed as to place it in the path of the incoming charge. The piston is now relieved eccentrically instead of all around and the connecting rod bearing is oiled by means of an oil ring catching oil, in addition to the oil it receives from the splash.

A number of improvements have been made in the Beeman garden tractor, the pioneer in its class. The crankpin bearing area has been increased. The clutch mechanism has been redesigned, so that both wheels

Fifty-five Per Cent of Pennsylvania Farmers Own Cars

SEVEN out of every hundred farmers in Pennsylvania purchased automobiles during 1920, while at the present time, fifty-five out of every hundred farmers in the State own automobiles, not including farm trucks. These figures are shown in a table prepared by Statistician L. H. Wible, of the Pennsylvania Department of Agriculture.

More than 100,000 farmers in the State own automobiles, many of these owning two and three machines, while there are 14,325 farms in the State upon which motor trucks are in use. Lancaster county easily leads in the

number of automobiles on the farms, this county having 7914 cars on its farms on January 1, 1921, while Berks county is second with 3836. Cameron county, with 90 automobiles, has the fewest of any in the State.

The following table shows the number of motor vehicles on the farms, January 1, 1921, based on the 1920 census figures which give Pennsylvania 202,298 farms, as compared with the number of January 1, 1920, which was based on the old census figures which gave Pennsylvania 219,000 farms:

Automobiles				Motor Trucks				Automobiles				Motor Trucks				Automobiles				Motor Trucks					
Counties	1920	1921	1920	1921	Counties	1920	1921	1920	1921	Counties	1920	1921	1920	1921	Counties	1920	1921	1920	1921	Counties	1920	1921	1920	1921	
Adams	1,576	1,726	58	87	Elk	537	514	40	70	Montour	411	402	50	54	Northampton ..	1,854	1,707	90	153	Northumberland ..	1,368	1,553	192	230	
Allegheny	2,991	2,463	440	660	Erie	2,480	2,742	168	357	Perry	771	884	20	46	Philadelphia	643	355	294	283	Pike	348	346	18	22	
Armstrong	1,234	1,810	97	135	Fayette	1,145	1,209	204	254	Potter	768	690	48	54	Schuylkill	1,501	1,660	432	597	Snyder	830	964	105	141	
Beaver	1,061	1,358	135	141	Forest	99	100	5	5	Somerset	2,163	2,360	150	225	Sullivan	394	376	15	18	Susquehanna ..	2,035	1,869	189	243	
Bedford	1,959	2,146	200	360	Franklin	2,550	2,525	105	180	Tioga	2,307	2,073	160	189	Union	786	903	90	80	Venango	894	758	45	67	
Berks	3,824	3,836	537	774	Fulton	598	648	44	97	Warren	902	871	37	46	Washington	2,840	2,913	165	202	Wayne	1,552	1,479	86	128	
Blair	933	894	285	186	Greene	1,641	1,647	126	112	Westmoreland ..	2,591	2,964	275	345	Wyoming	844	772	70	108	York	4,399	4,221	239	405	
Bradford	2,621	2,857	222	259	Huntington	1,143	1,140	42	90																
Bucks	2,890	3,200	360	600	Indiana	1,561	1,889	48	96																
Butler	2,233	2,743	132	241	Jefferson	1,108	1,179	25	46																
Cambria	1,242	1,439	261	348	Juniata	848	817	26	39																
Cameron	66	90	7	9	Lackawanna ..	677	679	160	276																
Carbon	468	475	96	111	Lancaster	7,043	7,914	328	385																
Centre	1,565	1,400	50	65	Lawrence	1,297	1,478	119	112																
Chester	3,400	3,856	456	575	Lebanon	1,263	1,423	36	80																
Clarion	1,696	1,671	110	110	Lehigh	1,713	1,746	195	225																
Clearfield	1,202	1,042	45	90	Luzerne	1,769	1,838	684	945																
Clinton	533	447	31	42	Lycoming	1,291	1,778	126	132																
Columbia	1,527	1,562	322	391	McKean	621	711	45	50																
Crawford	2,419	2,934	87	210	Mercer	2,023	2,474	204	232																
Cumberland	1,674	2,025	68	110	Mifflin	689	665	10	23																
Dauphin	1,503	1,636	69	130	Monroe	923	800	96	160																
Delaware	1,072	1,034	252	420	Montgomery ..	1,911	2,420	324	669																

British Authority Predicts All-Metal Plane in Future

ACCORDING to the *Morning Post* of London, Major-General Seely, Under Secretary of the State for Air, speaking recently at Cambridge at a meeting of the Air League of the British Empire, stated that: "Although great strides have been made in the science of aeronautics much remains to be done, and it is to Cambridge scientists

that we must look for great service in this respect. The aeroplanes of the future must be of all-metal. The present method of wood construction is quite wrong where an internal combustion engine is used. Greater safety and greater comfort are needed. We are behind other nations in this respect, and the need is a very urgent one."

Many Subjects Discussed at S. A. E. Tractor Meeting

Entire day given over to professional sessions and dinner during tractor show at Columbus. Plowing and belt speeds, non-freezing solutions, alcohol fuel and tractor tests are among the subjects discussed.

By P. M. Heldt

A ONE-DAY program devoted entirely to tractor subjects was arranged by the S. A. E. in connection with the Columbus Tractor Show. The professional session was held at the Southern Hotel and was followed by a tractor dinner at the Deshler. The first item on the program of the professional meeting was a report by D. L. Arnold on An Investigation of Plowing Speeds. A variety of opinions was expressed during the discussion. One member said that the average farmer liked to travel fast, and the idea of high speed plowing appealed to him. He also said that there is no inherent difficulty in high speed plowing. When an ordinary traction dynamometer record is inspected it is observed that the draft varies constantly between rather wide limits. This fluctuation of the drawbar pull is due to a number of causes, one being imperfect scouring of the plow. It is true that the draft increases with the speed.

Plowing Speeds

Another speaker, coming from Massachusetts, where the ground is decidedly stony, said that he hoped high plowing speeds would not be attempted in his neighborhood. An experience was cited of a tractor which when plowing 4 in. deep would pull a certain number of plows, but when setting the plow deeper one more bottom could be pulled. This was due to wire grass in the soil. When the plow was set for deep plowing it cut below the wire grass.

O. B. Zimmerman said that the plowing speed problem is an intensely serious one. If the draft increases with speed there would be a great waste of energy, and, besides, the increased wear and tear on the machine must be considered. The scientific method of arriving at results which had been followed by Mr. Arnold should be of great value to the country.

John Mainland made a report for the Committee on Pulley Face Widths and Speeds. This consisted chiefly of a report on the work done by this committee during the past year, and as the recommendations of the Committee were adopted by the Standards Committee at the New York meeting, what he said was in the nature of a review of the work accomplished the past year. Mainland said that as an implement man he favored tractor pulleys 2 in. wider than the belt width, instead of only ½ in. wider as recommended, in view of the difficulty of accurate alignment of the tractor with the threshing machine, but realized, that in many cases it is difficult to get such a wide pulley on the tractor. He said that one width of pulley recommended was 4 in., and that this is entirely inadequate for threshing. He was later informed by another member that the 4-in. pulley is not

intended for threshing but for such lighter work as feed grinding.

The Tractor Division of the Standards Committee during the past year adopted a recommendation to the effect that all tractors should be equipped with governors, and in this connection Mainland emphasized the importance of the governor in threshing. He said that the cylinder of a grain separator has a peripheral speed of 6,250 ft. per min.—a higher speed than the average flywheel rim, and that in four instances he knew of cylinders driven by tractor engines having no governor had burst due to excessive speed.

A paper on Anti-Freezing Solutions for Tractor Cooling Systems was read by O. B. Zimmerman. The author enumerated the qualities that must be possessed by a good non-freezing liquid. It must be cheap and easily obtainable; it must be non-corrosive and non-electrolytic. The specific heat should be as low as possible and the boiling point should not be too low. Table salt and calcium chloride are out of the question because of their electrolytic effects. Alcohol makes a good non-freezing solution, but owing to the fact that only the alcohol evaporates the operator is usually in the dark as regards the strength of his solution and its degree of safety.

Cooling Systems

Mr. Zimmerman spoke particularly favorably of the use of mineral oils in the cooling system, with which he had had practical experience on automobiles. One objection that has been made against the use of kerosene as a cooling fluid is that it gives off unpleasant odors, but this is of no particular consequence in connection with a tractor. The life of rubber hose in the cooling system, if kerosene is used, is from three months to two years. Some objection has also been raised to the use of kerosene on account of the fire hazard, but there is no record of a case of destruction due to this cause.

Mr. Secor of the Advance-Rumely Co. said that he fully agreed with what Mr. Zimmerman had said. There were some 50,000 Rumely tractors with oil-cooling system in service. The system, he said, is simpler than the conventional water cooling system, and the only attention required is the occasional repacking of the pump. The temperature of the radiator is higher at low loads than with water cooling. A somewhat larger pump is required than with water. The chief advantage of the oil cooling system is that the oil will not freeze. A cooling surface of 8 sq. ft. per b. hp. is allowed on tractors. The oil used is known as Winter black and has an initial boiling point of 550-575 deg. Fahr. The average temperature of the oil leaving the jacket is 175-200

deg. It rarely attains 225 deg. As a rule, the smaller the tractor, the higher the temperature that can be carried. There has been no trouble from jackets and radiators being clogged by the oil, and in general there have been no complaints in connection with the cooling system.

Mr. Arnold said that he had used kerosene in his automobile and had had no trouble with it. One hose lasted two years and another a year and a half. He expressed the view, however, that it could be used only with pump circulation, as a car with thermo-siphon circulation would quickly overheat when the cooling system is filled with kerosene, except perhaps in very cold weather.

Dr. Marshall of the Bureau of Standards spoke briefly on the principles underlying the design of cooling systems as developed at the Bureau particularly in connection with aircraft work.

At the afternoon session, Prof. Sjogren spoke on the tractor tests made at the Nebraska University. He presented a table giving the results of all tests made to date. Records of these tests have been published in AUTOMOTIVE INDUSTRIES. As is well known, quite a few tractors have had to be changed in one way or another before they could pass the tests, and in some cases the tests showed up defects of which the manufacturers' engineers knew nothing. Fan belts gave much trouble, and in some cases larger fans or larger radiators were installed. Sometimes there were indications that the water space around the cylinder head was too small, for the heads would overheat while the temperature of the outlet water was not excessive.

Air Washers

In a few cases heat control devices for the vaporising system were installed. Air cleaners of the dry type were often too small, and reduced the power of the engine unnecessarily. Prof. Sjogren said that air washers often proved ineffective because the farmer did not want to bother refilling them with fresh water and rather than do so took them off entirely.

It is desirable to be able to crank a tractor engine when the belt drive is in use. This is not possible with some designs. It was Prof. Sjogren's impression that ratings are being made on too narrow a margin. He also said that there is considerable diversity in the practice of rating. For instance, of three tractors fitted with the same engine ($3\frac{1}{8} \times 4\frac{1}{2}$ in.) one was rated as a 6-12 hp. at 1000 r.p.m., the second as a 5-10 hp. at 1000 r.p.m. and the third as a 6-10 hp. at 1200 r.p.m. Prof. Sjogren explained that in making the brake tests no allowance was made for losses in the belt. Prof. Magruder of Ohio State University thought that this method was open to criticism, as the loss in the belt will vary with the belt tension, and if the belt is crossed there is an additional loss. Prof. Sjogren answered that there is no easy method of making allowance for or determining the belt losses, and as the conditions were the same for all tractors, this was not considered necessary. An analysis of the results showed that two tractors developed less than 50 per cent of their belt horsepower at the draw bar, while the highest proportion of the belt horsepower developed at the drawbar was over 80 per cent. In the reports of the operators and observers it was stated whether the course of trouble was considered to be due to faulty material or faulty engineering, and both were found to be about equally frequent.

In Prof. Sjogren's report it was stated that 42 spark plugs were replaced during the tests, and this point was taken up by A. W. Scarratt, who gave it as his opinion that the fault was not with the plugs but in the design of the engine. He had found that out of 50 makes of

spark plugs only three would not give satisfactory service in kerosene-burning engines of the type built by his firm. What is necessary, he said, is a little more attention to the design of the spark plug bosses and their cooling means.

Mr. Zimmerman asked what relation exists between the drawbar pull and the weight of the tractor. It was pointed out that this relation depends on the diameter and width of the wheels and upon the type of lugs used. The weakest link in tractor operations, Zimmerman said, was the hold on the ground. The plow must be designed to give a maximum disturbance of the soil with a minimum energy consumption and the tractor must be the direct opposite. He voiced the opinion that an enormous amount of power is lost between the crankshaft and the drawbar.

Mr. Scarratt read a paper on the Carburetion of Alcohol, which is reproduced almost in full herewith. Prof. Norman of Ohio State University said that he did not expect to see a sufficient shortage of petroleum fuel in this country for many years to come, such as to give a chance to power alcohol.

There are enormous deposits of oil-bearing shales in Colorado which give an oil very similar to Pennsylvania crude, and recently large additional deposits have been discovered in Tennessee. In Germany successful use was made of alcohol-benzol-kerosene mixtures, and it was found that very lean mixtures were required. Mr. Secor said that in his opinion alcohol would not interest the present generation, except insofar as it relieved us of any anxiety as to what would become of our children after the last drop of gasoline has been used up. His firm some time ago received a report of a test with alcohol fuel on an Oil-Pull tractor made for the Estonian Government. No changes were made in the engine, which operated at 80-85 lb. compression, and the fuel consumption was determined to be 0.735 lb. per hp.-hr.

Replying to a question as to the practicability of working shale oil deposits, Mr. Peck said it had recently been proven that shale containing less than 20 gal. per ton had commercial possibilities. An oil field had recently been discovered near San Antonio, he said, which would supply us with oil for the next 300 years. ?

General Purpose Tractor

E. A. Johnston, chief tractor engineer of the International Harvester Co., spoke briefly on the subject of tendencies in traction design, and then showed motion pictures of an experimental tractor of which several samples had been built by his company. This is, perhaps, the most nearly universal machine that has ever been built. It is a three-wheeled type and was shown plowing, discing, cultivating, hauling wagons, operating self-binders, corn binders, corn huskers, seeders, a spraying outfit and hay machinery of all kinds.

In the discussion Mr. Johnston was asked how small a farm this outfit would be practical on. He replied that the horse eats the product of 5 acres and that this represents only 60 per cent of his total cost, so that he really costs as much as is obtained for the products from 8 acres. Usually 7 to 10 horses are kept on a 150-acre farm. Power apparatus can be operated at 60 per cent of the cost of horses. One of the advantages of a universal tractor with a set of specially designed implements as shown in the moving pictures is that a very material reduction can be made in the weight and cost of the implements. Some such development as that shown by the pictures, Mr. Johnston said, must be accomplished in order to reach the small farmer.

A representative of an electric lamp concern asked what were the chances of electric lighting coming into

general use on tractors, the same as on automobiles. Mr. Johnston replied that they were slight, so far as could now be seen. Night plowing was about as unsatisfactory as night work in the factory. There is always increased breakage, and the dew interferes to a certain extent with efficient work. The small farm is usually worked by the farmer alone, and he could not possibly work 24 hours a day. On the larger farms the equipment is usually adequate to make night plowing unnecessary. There is a slight demand for electric lighting equipment, but not sufficient to warrant the fitting of such equipment on all tractors.

Mr. Nash said that in California much night plowing is done, and usually by electric light. An outfit, which requires no battery and is suitable for two lights, has been developed by one of the large electrical companies. One of the most successful tractor owners works his tractors 22 hours a day during the season, six days of the week, and spends about one-half of the seventh day going over the machine.

Tractor Dinner Well Attended

The Farm Plow dinner was well attended. Fred Glover acted as toastmaster. The first speaker of the evening was J. B. Davidson, executive councilor of the American Society of Agricultural Engineers. Dr. Davidson quoted a noted Canadian to the effect that there are only three primary vocations, namely, agriculture, home-making and education. He asked what made for a high standard in agriculture. Some people claimed that it was maintenance of soil fertility. If that was so then agriculture has attained its highest development in Korea, where fertility of the soil has been maintained for forty centuries. However, in Davidson's estimation soil fertility and plant breeding are not key factors in agriculture. There are 8000 fewer farmers in Iowa to-day than there were 10 years ago. The percentage of the agricultural population did not make for a high standard of farming.

He would align himself with that new school of economists who say that what we want is efficient agriculture. This is measured by capacity for production. The health of the people on the farm is a factor. Many of the operations on the farm are mechanical in nature. Thus, for instance, harvesting and carrying the products to market are mechanical operations. Thirty times as much grain is produced now as in 1830. Before the war 9,000,000 people in the United States produced as much grain as 66,000,000 in Europe. An enormous amount of power, aggregating 25,000,000 hp., is used in agriculture, far more, according to statistics quoted by Davidson, than used in the industries.

Engineer in Agriculture

Davidson said that there is a big field for the engineer in agriculture. There are in this country 200 million acres that can be reclaimed by clearing, 80 million acres that can be reclaimed by drainage and 150 million acres that can be reclaimed by irrigation. There is, therefore, no danger of a shortage of arable land. The farmer is thinking of two things just now; one is how to get more for his product, and the other, how to reduce his cost, and in this latter connection at least the engineer could be of great service to him.

The second speaker was L. J. Taber, Master of the Ohio State Grange. He said that the triumph of the century, which has changed barbarism to civilization, has been all the work of the engineer. For thousands of years agriculture was carried on in the same old way, but there has been a mighty change in the last half century. Power and farm machinery are closely inter-

woven. There is none of the radicalism among Ohio farmers that has made itself evident in other sections, and there would be none unless the financial and manufacturing interests failed to take heed of conditions in the country.

Farmers' Strike Result of Inexorable Conditions

Speaking of deflation brought us face to face with the subject of the so-called farmers' strike. The American farmer purchases 45 per cent of the manufactured articles that are not exported. There has been a 45 per cent decline in the value of farm products in the last six months. The condition referred to is not exactly a strike but simply the working out of inexorable conditions. The farmer cannot do without the things essential to efficient production. The great need to-day is the creation of a better understanding between town and country.

It is necessary to lighten the task of the farmer's wife. The farmer must have sufficient reward to enable him to put electric light into his home, to put in power washers and other labor-saving devices for the home. There can be no permanent prosperity in farm life while marketing problems are being neglected. We must have a proper co-operative movement among farmers, a community organization looking after the sale of farm products and the purchase of farm necessities on a co-operative basis. The farmer wants to become a businessman besides.

The last speaker was W. H. Stackhouse, President of the National Implement and Vehicle Association, who presented a good deal of statistical matter bearing on farm production and on the prices of farm products and other merchandise. Mr. Stackhouse said that in 1820 95 per cent of all the people of this country lived on the farm, whereas the percentage in 1920 was only 49. In 1849 the wheat produced in the United States amounted to 4.3 bushels per capita, while in 1920 it amounted to 9.4 bushels.

Farmers' Purchasing Power

According to Mr. Stackhouse it would be utter folly to deny that the world-wide business depression had not affected the farmer. The farmer's purchasing capacity is not the same to-day that it was a year ago. Within the last few days the Department of Agriculture has published figures showing that the value of all farm products in 1920 was \$19,856,000,000, which is about five billion dollars less than in 1919, but it would be taking a wrong view of the matter to say that the farmer has lost this amount. The value of farm crops alone in 1919 amounted to \$11,405,000,000. From 1913 to 1920 the cost of farm implements increased 78 per cent; the value of farm products, 112 per cent; the value of labor, 115 per cent, and the value of all other commodities, 144 per cent.

Referring to the reputed pressure on farmers to keep them from buying, Mr. Stackhouse said just because it's raining we need not think that it's never going to shine. The farmer wants the cost of manufactured products reduced, and he can be assured that just as soon as the replacement cost of manufactured articles is reduced the manufacturer will lower his prices. It would be folly for him to follow the suggestion to cut prices at once and shoulder the loss, as that would simply lead to a crop of failures. In concluding Stackhouse referred approvingly to the movement inaugurated by the Government during the war of causing the number of different items of manufacture to be reduced, and to the National Repair Week fathered by the National Implement and Vehicle Association.

The Carburetion of Alcohol

AT the tractor meeting of the S. A. E. held at Columbus on February 10, A. W. Scarratt, engineer of the Minneapolis Steel & Machinery Co., presented a paper on the above subject. Mr. Scarratt's firm is doing considerable business with South America and other foreign countries where petroleum distillates are very expensive. He mentioned Cuba, Brazil, Argentina, Chile, Porto Rico and Venezuela, where the introduction of tractors is hampered by the high cost of kerosene, while alcohol is produced in vast quantities and is comparatively cheap. Quoting Mr. Scarratt:

"Naturally, if American tractors are to succeed in these countries they must be equipped to operate on alcohol in an economical and efficient manner. Many manufacturers will claim that their engines will operate on alcohol, and they will, but in a very inefficient and wasteful manner because they are not primarily designed with a view to using this as a fuel. * * *

"The Minneapolis Steel & Machinery Co. has exported a large number of tractors in the past twelve years, during which time many of them have been required to operate on alcohol. But it is only in the last year that the demand for greater economy and efficiency when using alcohol has been seriously felt. During 1920 we have done some intensive studying and experimental work in the development of an engine which will burn alcohol economically and efficiently. * * *

"Alcohol is difficult to vaporize, hence difficult to start on; it ignites at a considerably higher temperature than gasoline, is only 6/10 as rich in heat units as gasoline by weight and is 15 to 20 per cent heavier by volume. Commercial alcohol contains approximately 10 per cent of water by weight and from 10,000 to 12,000 B.t.u.'s per pound, its specific gravity is from .80 to .84 at 60 deg. Fahr., and its range of distillation temperatures is from 158 deg. Fahr. to 175 deg. Fahr., and it is a vegetable derivative. These physical characteristics are quite different from the common petroleum fuels.

"We knew that higher compression was necessary, but as engine size and design influences operation to a large extent, our first problem was to establish an approximately satisfactory compression pressure from which to start our experiments. Our first trials were with 127 lbs. gage compression at normal operating speed. The next problem was to determine what amount of heat applied to the mixture was desirable and its general effect on economy, output and operation. Here we had a real surprise when we discovered that more heat is needed for good operation on alcohol than is required for using kerosene.

"Our next concern was in regard to the power output, which we found was equal to the power developed when using good kerosene. We then concerned ourselves with the general operation of the engine and finally with the fuel consumption. At first the operation was not good at low engine speeds when under sustained load, and the fuel consumption was higher than we liked, but by perseverance and patience we overcame these obstacles and produced very creditable characteristics with good economy and excellent operation and with two distinct and totally different types of carbureting and manifold systems, one of which was the special Twin City-Holley system worked out by our company and employed on all Twin City tractors at the present time, and the other was the Twin City vaporizer system.

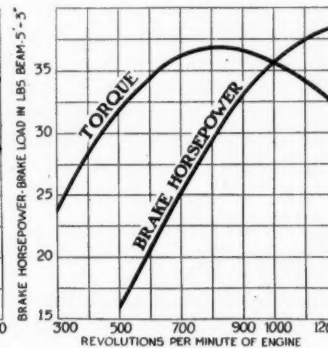
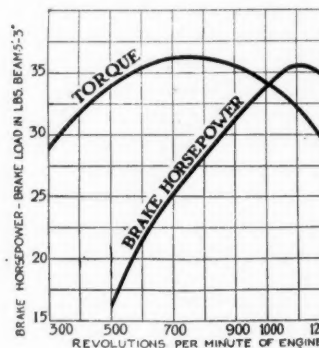
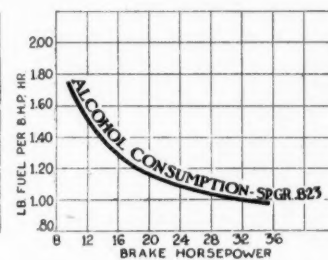
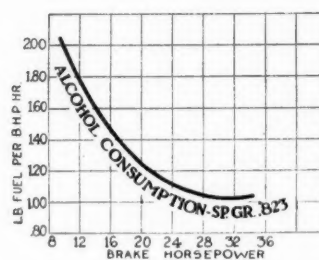
"We felt that if we could obtain the same power with alcohol as with gasoline or kerosene for the same expenditure in B.t.u.'s of fuel, per b.h.p. developed, that

we would be doing very well. As a matter of fact, we have exceeded these hopes slightly and actually show a fair increase in thermal efficiency.

"Our experimental work was done on a 4-cylinder 4 1/4 x 6 in. 16-valve engine. At first no heat was applied to the intake manifold and we were only able to develop 29 b.h.p. at 1000 r.p.m., using 127 lbs. compression, whereas we could easily develop 35 h.p. with kerosene, using 63 lbs. compression. When running with a cold manifold, the temperature of the intake charge dropped to 35 deg. Fahr., frost collected on the manifold and water froze on certain portions of it. It was necessary to choke the carbureter to a considerable extent and very unsatisfactory operation was the result. We then applied heat, with the result that the horsepower increased from 29 to 35 and operation was very much improved, although the engine would not pick up its load at low speeds.

"An intake manifold with glass inserts was used which showed that a large amount of wet, unvaporized fuel was going over to the engine. We then increased the heat still more, by connecting two air heaters for the carbureter intake in series. This dried out the mixture but decreased the horsepower from 35 to 33, although the fuel consumption was decreased considerably, being 1 lb. per b.h.p.-hour. With this set up, the inlet air to the carbureter reached a temperature of 210 deg. Fahr. but after being carbureted the intake gas temperature dropped to 138 deg. Fahr., with an exhaust gas temperature of 215 deg. Fahr. We then decided to drop our compression pressure to 100 lbs., with the result that nearly equal h.p. was developed, the fuel consumption was not increased and the operation was improved at low engine speeds.

"We then tried an intermediate compression, using 110 lbs., which was finally adopted as giving the most satisfactory results. With this compression we had no difficulty in obtaining an output of 35 h.p., which was equal to that developed when using kerosene, and fuel consumption at maximum load remained 1 lb. per



Power curves of Twin City 4 1/4 x 6 in. four-cylinder tractor engine running on alcohol with two different carbureters

b.h.p.-hour. The alcohol used in this experimental work contained 10,500 B.t.u.'s per pound. An equivalent gasoline consumption by weight would show a fuel consumption of approximately 0.55 lb. per b.h.p.-hour, which is exactly equal to the finest performance which we have obtained on this engine using gasoline and which is decidedly more economical than average engine performance indicates.

"The difficulties of starting are increased somewhat when using alcohol, due to the greater starting effort necessary for cranking the engine and also because air, at ordinary temperatures, does not vaporize the alcohol sufficiently to make a good combustible mixture. Satisfactory starting was accomplished by a redesign of the starting crank coupled with the use of a mixture of alcohol and gasoline, the ratio being four parts alcohol to one of gasoline.

"Following are a few of the important features which we believe necessary for the proper use of this fuel. In our case, 110 lbs. compression proved most satisfactory. Very liberal provision for heating the fuel charge must be made. Use of the entire exhaust heat will be found necessary. The temperature of the incoming charge of fuel for good carburetion and economical operation should not be less than 100 deg. Fahr. Careful consideration should be given to the design of the intake manifold so as to obtain uniform distribution. At high compressions this is very essential, especially when using alcohol. Gas velocity is important. The intake manifold gas velocity, at full load, should not be less than 9500 ft.p.m. average.

"In our opinion, alcohol is an ideal fuel. It is completely distilled or vaporized at practically a constant temperature. This is a decided advantage and once the engine is properly warmed up, the operation is all that can be desired. There is practically no carbon residue created when using alcohol and the condition of the valves and valve seats, after long periods of heavy run, is surprisingly good.

"We are thankful that it was necessary for us to do this experimental and development work with alcohol. In our opinion the use of alcohol as a fuel, eventually is bound to come in the United States. We believe that the entire automotive industry should get behind this idea and bring it about as quickly as possible so as to provide another source of fuel supply and to bring down the operating costs of all equipment, depending now on hydro-carbon fuels. There are millions of tons of vegetable matter unused in the United States yearly from which alcohol could profitably be manufactured. If the manufacture of alcohol for fuel purposes is demanded by the automotive industry it will head the list of automotive fuels eventually."

AN interesting volume treating of the organization and management of trade associations has been published by the Ronald Press Company. It analyzes in detail the purpose, structure, procedure and value of the trade association and contains a very complete and accurate list of trade associations and their addresses. The book is written by Emmett Hay Taylor.

Safety in Spring Shackles

WRITING in *Engineering* on defective design in motor trucks brought out by war service, F. Strickland remarks that a point affecting the safety of light cars is the arrangement of the spring hanger of the front spring. With the usual arrangement of front springs the axle is attached to the frame only by the front part of the spring. A considerable number of springs broke, and if the fracture was between the axle and the front spring horn there was nothing to hold the axle except the rear shackle.

In the earlier days of motor cars the shackle was in tension, being hung from a bracket as shown in Fig. 1, following carriage practice. Later, however, the shackle was generally put in compression (See Fig. 2) as a bracket is saved and the appearance is neater.

In case the front spring breaks in front of the axle, the construction shown in Fig. 1 is in stable equilibrium while that in Fig. 2 is not. Further, in the first case the motion backwards is limited, while in the second the link may swing back to the position shown in dotted lines. In the latter case the motion of the axle is considerable, and the car frequently gets quite out of

control. The result of this, in France, was a number of very serious accidents owing to the cars running off the road at speed. In order to avoid these a short length of belting was fixed under the spring at the spring seat and attached at the front in such a way as to prevent the axle going back in case of the spring breaking. While this belting was the usual method of securing the axle in the service there are neater ways of doing it.

Figs. 3 and 4 show two methods which were tried and found effective. In Fig. 3 two short lengths of angle iron bolted to the shackle formed stops so that in case of the spring breaking the motion of the shackle was limited. This proved effective and was easily adapted to the spring shackles of some cars. It was very cheap and easy to apply, requiring only two pieces of angle iron about 2 in. long, and one bolt for each front spring shackle.

Fig. 4 illustrates another arrangement, which was also very effective and not expensive. In this case a plate about 1/4 in. thick is bolted to the frame. This plate has a slot allowing the necessary motion to the shackle, but preventing motion beyond this.

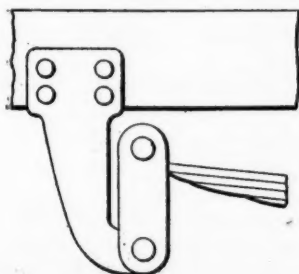


Fig. 1

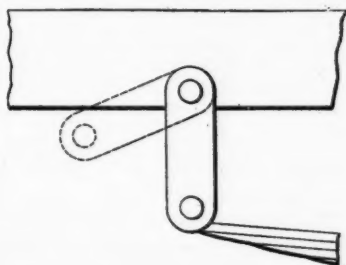


Fig. 2

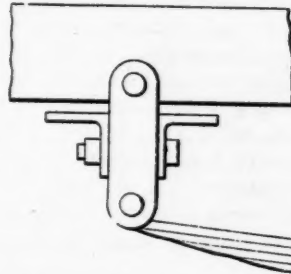


Fig. 3

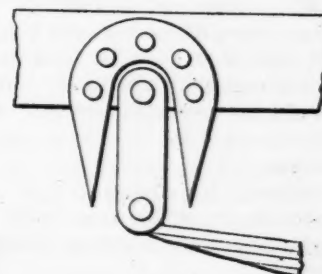


Fig. 4

Means of Materially Increasing Thermal Efficiency

This article, though written with special reference to aircraft engines, contains extremely valuable suggestions applicable to other automotive types, and is worthy of careful study by all who desire to improve the thermal efficiency of these engines. The use of stratified charges and other means for improving efficiency are clearly outlined.

By H. R. Ricardo*

IN presenting this paper the writer aims to indicate certain possible lines of development and research which his investigations and preliminary experiments have shown to be at least worthy of serious consideration. If we review the present state of the art we find the position to be substantially as follows: From a thermodynamic point of view the performance of the modern aero engine has approached so nearly to the ideal obtainable from the cycle on which it operates that there is little scope for improvement. Thermal efficiency or fuel consumption is now the all-important factor, but since the best modern aero engines are actually developing a thermal efficiency within 4 per cent or 5 per cent of the highest obtainable from the cycle on which they operate, it is evident that to gain any further improvement it will be necessary either to depart from, or at least to take considerable liberties with, the accepted cycle, or to modify the composition of the fuel, or both. The cycle on which all present-day aero engines operate is one in which an explosive mixture of fuel and air is drawn into the cylinder compressed to the highest pressure permissible without detonation and ultimate pre-ignition, then ignited at constant volume and expanded until it occupies the same volume as before compression, after which it is released and the cycle is repeated. The theoretical efficiency of this cycle is given by the formula $E = 1 - (1/r)^{r-1}$. This is known as the air standard efficiency; it assumes that the specific heat is constant at all temperatures, that there is no loss of heat and that there is no dissociation. According to this formula the efficiency is dependent upon r , the expansion ratio. In the ordinary cycle r is also the compression ratio, since compression and expansion happen to be equal, but it must be remembered that it is the expansion and not the compression ratio which governs the efficiency, and that the two need not necessarily be equal.

The most recent investigations on the properties of the working fluid carried out by Mr. Tizard and Mr. Pye and corroborated by the writer's experimental results, show that when due allowance has been made for the losses due to change of specific heat and to dissociation at the temperatures which actually obtain in the cylinder, the true limiting thermal efficiency becomes approximately $E = 1 - (1/r)^{0.295}$. This formula takes no account of the losses due to the direct passage of heat to the cylinder walls during combustion and expansion. It is clearly impossible to arrive at a really universal formula which will take this into account, since the proportion of heat lost

must depend upon the form of the combustion chamber, the speed, and, in fact, on the individuality of each engine. In the most perfect case of an engine having a compact and symmetrical combustion chamber and running at a high speed, so that the direct heat loss during combustion and expansion is reduced to the absolute minimum, the highest attainable indicated thermal efficiency is given pretty accurately by the formula $E = 1 - (1/r)^{0.295}$. This allows for the minimum possible heat loss to the jacket walls and may be regarded as the absolute limiting thermal efficiency obtainable under the best possible conditions, assuming:—

- (1) Perfect carburation and distribution.
- (2) That the compression and expansion ratios are equal.
- (3) That the mixture is homogeneous and of the most economical strength.

The following table (Table I) illustrated by the curves in Fig. 1 gives, in column (1) the air-cycle efficiency for a range of compression ratios from 4:1 to 8:1, column (2) Tizard and Pye's ideal efficiency, taking into account losses due to change in specific heat at high temperatures and to dissociation, column (3) the highest attainable indicated thermal efficiency assuming that the combustion chamber is designed to allow of the minimum possible heat loss, that the cylinder is of comparatively large capacity and that the revolutions are not less than 1500 r.p.m. In column (4) are given the actual indicated thermal efficiencies as obtained in a special variable compression engine designed by the writer for research purposes, and in which every known artifice for obtaining the highest possible efficiency and power output has been employed.

TABLE I

Ex- pansion Ratio	Col. 1 $E = 1 - (1/r)^{0.4}$	Col. 2 $E = 1 - (1/r)^{0.295}$	Col. 3 $E = 1 - (1/r)^{0.25}$	Col. 4 Observed Results Variable Com- pression Engine
4.0	0.4256	0.336	0.296	0.277
4.5	0.4521	0.359	0.314	0.297
5.0	0.4747	0.378	0.332	0.316
5.5	0.4944	0.396	0.348	0.332
6.0	0.5116	0.411	0.361	0.346
6.5	0.5270	0.424	0.375	0.360
7.0	0.5398	0.437	0.386	0.372
7.5	0.5534	0.449	0.396	0.383
8.0	0.5647	0.460	0.406

The difference between columns 3 and 4 indicates the scope left for improvement—it is very narrow. So long as the recognized cycle is adhered to, in its entirety, the importance of raising the compression and, therefore, the ex-

*From a paper read before the Royal Aeronautical Society of Great Britain, Dec. 1920.

$$1 - \left(\frac{1}{5}\right)^{5-1} = 1 - (0.2)^4$$

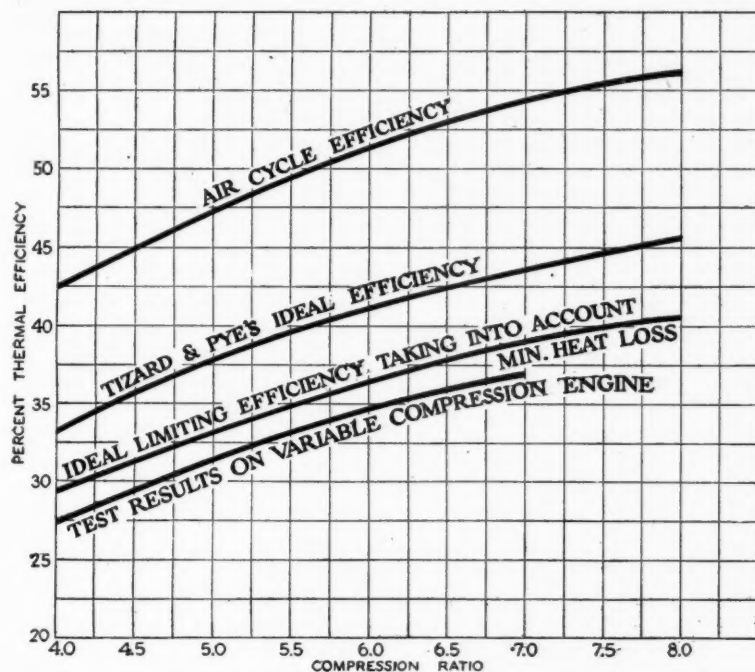


Fig. 1—Curves showing efficiencies with varying compression ratio

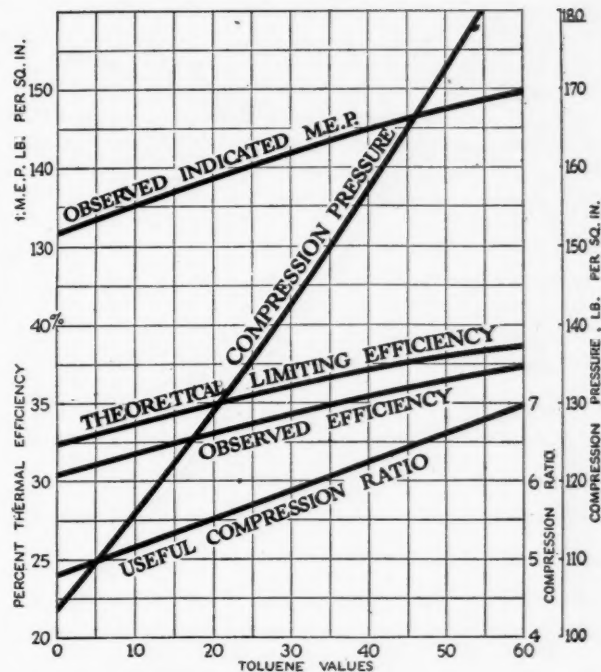


Fig. 2—Curves showing toluene values, compression ratio, efficiencies and observed I. M. E. P.

pansion is obvious. Now when working with all fuels belonging to the general group known as gasoline the compression pressure which can be employed is limited by the tendency of the fuel to detonate and ultimately to pre-ignite. The explanation of the phenomena of detonation appears to be as follows:—When the mixture is ignited from any one point, the flame at first spreads by the normal process of flame propagation aided by turbulence and in doing so compresses before it the unburnt portion of the charge; unless the latter can get rid of its heat with sufficient rapidity, it is liable to be compressed to a temperature exceeding its self-ignition temperature, with the result that it ignites spontaneously throughout its whole bulk and an explosion wave is set up which strikes the walls of the cylinder with hammer-like blows, giving rise to the familiar noise known as "pinking." This explosion wave further compresses the portion of the charge first ignited, thus still further raising its temperature, and with it the temperature of the igniter points or any other partially insulated object in the neighborhood from which ignition first started, to so high a temperature as ultimately to cause pre-ignition and loss of power. Pre-ignition, which is the ultimate limiting factor controlling the compression, never occurs under normal conditions with gasoline, except as a result of persistent detonation. If detonation be prevented, a much higher compression can at once be used without any risk of pre-ignition, and a very decided gain both in power and efficiency obtained thereby.

There can be little doubt that detonation depends primarily upon the normal rate of burning of the fuel, and this in turn depends upon the pressure, and, to a less extent, upon the temperature at the time of ignition. If means be adopted either for slowing down the normal rate of burning or raising the self-ignition temperature of the fuel, or both, detonation can be kept in control and a much higher compression ratio can be used. Either or both of these methods are available. With the exception of ether, acetylene and hydrogen, fuels composed of light paraffin fractions have been proved to be the worst offenders as regards detonation—they are chain compounds and therefore chemically unstable, their ignition point is low, and their normal rate of burning very rapid. On the other

hand, fuels belonging to the aromatic group, such as benzol, toluene and xylene are ring compounds of greater chemical stability and high ignition temperature, they cannot be made to detonate even with compression ratios as high as 7.5:1.

It has been known for a long time that by adding benzol to paraffin petrols the tendency to detonate could be greatly reduced, but recent experiments at the writer's laboratory have shown that of these three members of the aromatic group, benzol is the least effective and toluene the most, while xylene occupies a position midway between the two. On account of their relatively low heat value per pound, it is naturally desirable to employ as small a proportion of aromatics as possible. Of the three aromatics mentioned, benzol has also the highest specific gravity and the lowest heat value per pound. It is, therefore, from every point of view the least efficient of the three. Experiments on the variable compression engine have shown that the compression pressure can be raised in direct proportion to the aromatic content of the fuel. A light paraffin freed from aromatics and consisting mainly of fractions of the paraffin series, but conforming in every respect to the Air Ministry's specification for aircraft spirit, detonates under normal conditions as to temperature, etc., and with the most efficient mixture strength and ignition timing, at a compression ratio of 4.85:1 (the degree of compression at which detonation starts being very sharply defined). By adding 20 per cent of toluene the compression can be raised from 4.85:1 to 5.57:1, the gain in efficiency on actual test is found to be from 31.1 per cent to 33.5 per cent, and in mean effective pressure from 131.8 lb. per square inch to 140 lb. per square inch. Now the addition of 20 per cent toluene adds less than 2 per cent to the weight of the fuel per unit of heat and permits of an increase in efficiency of 7 per cent. The net gain is, therefore, very considerable. Finding toluene the most efficient medium for preventing detonation, it was decided to express the tendency of fuels to detonate in terms of their toluene value.

Starting with a light paraffin gasoline, freed from aromatics, the relation between toluene value and the highest compression ratio which could usefully be employed was

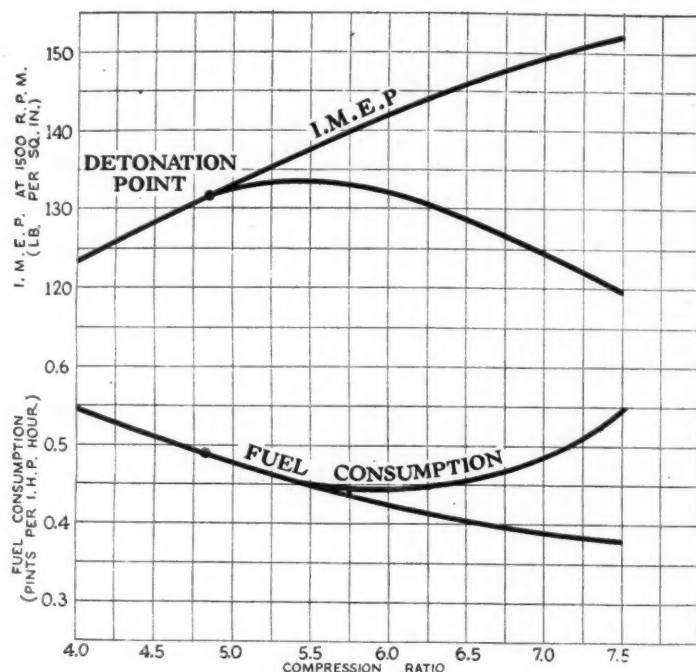


Fig. 3—Curves showing fuel consumption and I. M. E. P. with cooled exhaust gas

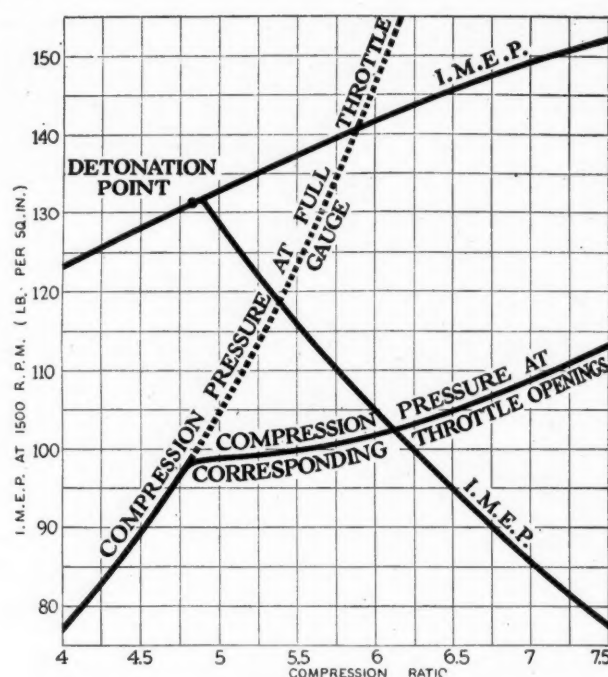


Fig. 4—Curves showing I. M. E. P. and compression pressure with varying compression and throttling

found to be as shown in the table, and the curves in Fig. 2.

Toluene Value	Compression Ratio	Ind. Mean Pressure as Found by Experiment	Ind. Thermal Efficiency as Found by Experiment	Limiting Ind. Efficiency
0	4.85:1	132.5	0.311	0.327
10	5.20:1	135.4	0.323	0.338
20	5.57:1	138.7	0.335	0.350
30	5.94:1	142.0	0.347	0.361
40	6.32:1	144.9	0.355	0.371
50	6.67:1	147.5	0.365	0.380
60	7.05:1	150.0	0.373	0.388

Toluene Value	
Toluene	100
Benzine	66
Xylene	83
Ethyl-alcohol, 99 per cent	166
Acetone	75
Cyclohexane	30
Carbon bisulphide	10
Methyl mercaptan	5 to 10
Ether	60

Later investigations showed that toluene was not the most efficient dope, and that, in fact, it could not compare with alcohol, though this fuel is not likely to be of much value for aircraft on account of its low heat value per pound. The preceding table gives the toluene values of a number of different fuels.

From this table it will be seen that the fuel known as hectar, and consisting of 50 per cent benzol and 50 per cent cyclohexane, which the Americans have found so successful, therefore has a toluene value of 48, and could be used with a compression ration of 6.6:1.

It is well to emphasize the fact that of all the known volatile hydro-carbon fuels the total internal energy (taking into account the heat of combustion on the one hand and the change in specific volume on the other) is substantially the same, that is to say, when completely evaporated and used at the same compression ratio, all fuels, irrespective of their heating value, will give the same thermal efficiency and the same power to within about 2 per cent. The only exception is alcohol and the other members of its group; these, under normal conditions, give a slightly

higher power because the increase of specific volume after combustion is very considerable, and also in practice owing to their higher latent heat they are seldom completely evaporated, with the result that a considerable amount of evaporation takes place in the cylinder during the suction stroke, thus both increasing the weight of charge and reducing the compression temperature. Popular theories that benzol or mixtures of benzol and gasoline give higher power at the same compression than pure gasoline, owe their origin to the fact that most engines have already too high a compression for efficient use with pure gasoline, with the result that a late ignition setting and often an over-rich mixture also must be used. The addition of benzol in such a case permits of the use of full ignition advance and the most efficient mixture strength, and so gives rise to this very prevalent impression. Actually the total internal energy of, and therefore the power output available from, benzol is very slightly less than gasoline.

Apart from varying the composition of the fuel, which is not always practicable, a somewhat similar increase in compression and therefore in efficiency can be obtained by the addition of inert gases which serve merely to delay the normal rate of burning. Experiments with pure aromatic-free gasoline of 0 toluene value showed that the safe compression ratio could be raised from 4.85 to 1 up to 7.5:1 by the addition of cooled exhaust gas. Fig. 3 shows the relation between mean pressure, thermal efficiency and compression ratio, when just sufficient exhaust gas was admitted in each case to check detonation. The upper part of the I.M.E.P. curve and lower part of fuel consumption curve show results obtained with a fuel of high toluene value and of the same total internal energy. The divergence between the two mean pressure curves indicates approximately the proportion of inert gas added. It will be observed that the compression ratio can be raised at once from 4.85:1 to over 6:1 without any reduction in power whatever, and with a very substantial gain in efficiency; thus it is possible to improve the economy of an engine by as much as 6 per cent without affecting its horsepower one way or the other, by the mere addition of exhaust gas, costing nothing, and adding nothing to the weight of the engine.

To appreciate the possibilities of the use of exhaust gas in this manner, let us suppose that we have a fuel of 0 toluene value. With such a fuel the highest compression ratio we can use if the engine is to be capable of running "wide open" at ground level, and with an economical setting, is only 4.85:1, corresponding to a limiting thermal efficiency of 32.7 per cent. By the addition of cooled exhaust gas a compression ratio of say 7:1 giving a limiting thermal efficiency of 38.6 per cent could be used and still permit of the engine being run wide open on the ground with perfect safety, and developing even at ground level very nearly the same power as the lower compression engine. As the machine ascended the quantity of exhaust gas would be reduced until at about 12,000 ft. it could be cut off altogether. It will be seen that, in this manner, not only can a high compression engine be made to operate safely on the ground with any fuel, but that the control of exhaust gas can be made to afford a very efficient altitude compensator. By way of comparison, tests were run with varying compressions and with a fuel of 0 toluene value in order to ascertain the relation between mean pressure, compression pressure, and compression ratio when detonation is prevented by throttling. The results obtained are shown in Fig. 4, and require no particular explanation. It is interesting to note, however, that detonation became apparent at very nearly the same compression pressure in all cases. By way of comparison it will be noted that with this fuel the throttled engine with 7:1 compression ratio can develop only 57 per cent of its full power on the ground while the exhaust controlled engine can develop 84 per cent.

Safety Fuels.—A good deal of interest has been shown lately in the question of employing fuels of high flash-point to avoid fire risks. So far as the writer is aware, kerosene only has as yet been seriously considered. There are two possible methods of dealing with this fuel: (1) by vaporizing it and so using it in a normal type of engine; (2) by injecting it into the cylinder as a liquid, either during the suction stroke or at the end of compression. With regard to the first method, commercial kerosene consists almost entirely of heavy fractions of the paraffin series. These are all chain compounds, and their chemical stability decreases with increase in molecular weight. From the point of view of detonation, therefore, kerosene is one of the most troublesome fuels in existence. Further, in order to vaporize a reasonable proportion of it, it is necessary to raise its initial temperature to certainly not less than 140 deg. Fahr. This means a reduction in the weight of charge of at least 20 per cent as compared with gasoline, and a corresponding reduction in mean pressure. Further owing to its chemical instability on the one hand and the high compression temperature resulting from pre-heating, the limiting compression is reduced to about 4.2:1, corresponding to a limiting thermal efficiency of only 30.2 per cent and a limiting indicated mean pressure of only about 115 lb. per square inch, or say, 100 lb. per square inch brake pressure. Again, no means have yet been discovered of preventing the heavier fractions condensing on the cylinder walls and passing down into the crank-case, where they soon prove destructive to the bearings, etc. So serious has this trouble proved in the case of stationary kerosene engines that so far the only kerosene engines of normal type which have given consistently satisfactory results over long periods are those in which the working parts are open and each bearing is lubricated individually. Although detonation can be kept in check and a comparatively high compression ratio employed with the help of the addition of exhaust gas, yet the low-power output, the condensation trouble, and the low efficiency are such serious drawbacks as, in the writer's opinion, to put kerosene out of court as a fuel for existing types of aero engines.

The alternative method of injecting the fuel is not much more hopeful so long as it is applied to the existing type of engine. If the fuel is injected on the suction stroke one avoids the loss due to pre-heating, and can, therefore, use a higher compression and obtain considerably higher power, but the condensation trouble becomes more serious than ever, while the problem of measuring and pumping small quantities of fuel and maintaining correct proportions between the fuel and air at all loads and speeds is no easy one.

Lastly, if the fuel be admitted at the end of compression and ignited on entry by means of a hot plate or other igniter, the very formidable difficulty of so pulverizing and distributing the fuel that each particle can find at once the necessary air for complete combustion has got to be tackled; it is one which is very familiar to the author from bitter experience with Diesel and semi-Diesel engines. There is, however, another way of dealing with the high flashpoint fuel problem which, in the writer's opinion, is the most hopeful at the moment. Many natural kerosenes contain a considerable proportion of heavy aromatic hydrocarbons having the same characteristics as regards flash-point as the kerosene of which they form part. These aromatics burn with a smoky flame, and are therefore very objectionable when the fuel is used as an illuminant. Recently steps have been taken to isolate and remove these heavy aromatics, and at the present time they are being removed at the rate of several thousand tons per month. Their use as a safety fuel for aircraft engines is worthy of careful consideration. Owing to their almost complete immunity from detonation they can be used with a very high compression ratio, even after pre-heating in a vaporizer. Experiments made with these aromatic extracts show that with an inlet temperature of 140 deg. Fahr. it is still possible to use a compression ratio as high as 6:1, and even 6.5:1, with the result that the efficiency is very high and the power output equal to or very nearly equal to that obtained with ordinary gasoline of low toluene value. Direct comparative tests carried out with kerosene and samples of these aromatic extracts gave the following results:—Kerosene, sp. gr. 0.812; I.M.E.P., 111.0; fuel pt. per 1 h.p. hour, 0.595; aromatic extracts, sp. gr. 0.884; I.M.E.P., 125.5; fuel pt. per 1 h.p. hour, 0.42. In both cases exactly the same vaporizer temperature was used, the only difference being in the compression ratio employed. The results obtained are, in the writer's opinion, sufficiently encouraging to justify further investigation. The difficulty of condensation still remains, but this appears to be less serious than with kerosene, since the freedom from any tendency to detonate permits of more pre-heating, while it is open to question whether the heavy aromatic condensate is as destructive to lubrication as the kerosene.

Influence of Mixture Strength.—Because of the losses to dissociation, change of specific heat and direct heat losses, the limiting efficiency obtainable under the best conceivable conditions is only about 70 per cent of the air cycle. Now each of these sources of loss is a direct function of the maximum temperature, which in turn is dependent upon the mixture strength. When the mixture is so proportioned that the whole of the available oxygen is just combined, the maximum temperature rises to approximately 4500 deg. Fahr., and the mixture strength is then approximately 47 ft.-lb. per cubic inch. As the mixture is weakened the maximum temperature is, of course, reduced, at first only very slightly, but so long as a homogeneous mixture is employed it is not possible to reduce the mixture to below about 40 ft.-lb. per cubic inch, without serious loss of efficiency due to incomplete combustion, owing to the limited range of burning of all volatile hydrocarbon fuels.

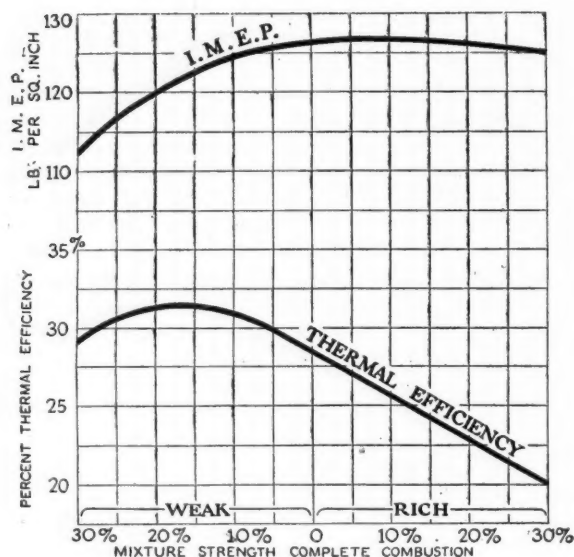


Fig. 5—Curves showing I. M. E. P. and thermal efficiency with varying mixture strength, compression ratio 6:1. Fuel, benzol

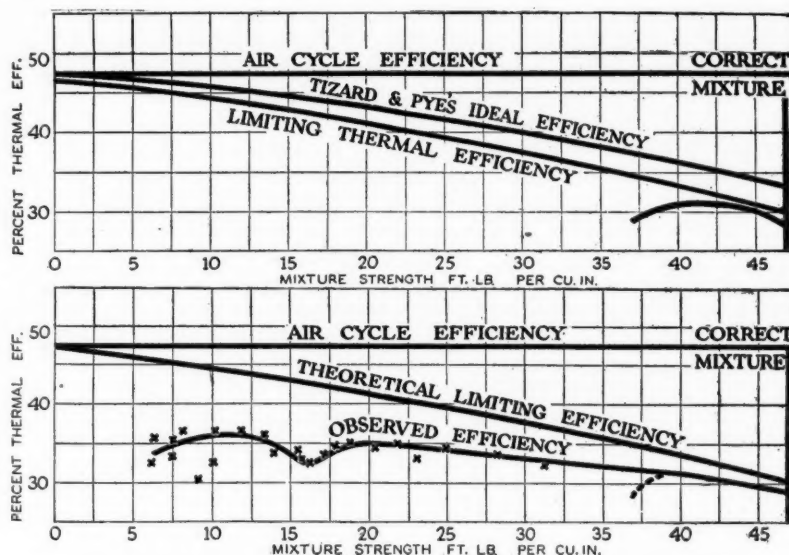


Fig. 6 (Upper)—Curves showing air standard efficiency, actual and theoretical, down to the point of no heat supply. Compression 5:1

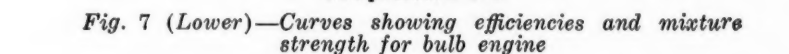


Fig. 7 (Lower)—Curves showing efficiencies and mixture strength for bulb engine

The writer has carried out a very large number of tests on about 40 different fuels in order to ascertain the relation between mixture strength, power and economy. Except for insignificant variations, the characteristic efficiency and power obtained by gradually weakening the mixture is the same for all fuels and at all compressions, excepting alcohol, which on account of its greater latent heat and its large increase in specific volume gives increasing power as the mixture is enriched for a long period after the point of complete combustion has been passed.

The curve (Fig. 5) shows the relation between thermal efficiency and mixture strength expressed in terms of mean pressure. The example shown is taken with benzol at a compression ratio of 6:1 and, with but infinitesimal variations, it may be taken as applying to any fuel except alcohol. It will be observed that maximum efficiency is obtained when the mixture strength is such that the mean effective pressure is about 3 per cent below the maximum. Any further weakening of the mixture results merely in loss of efficiency due to incomplete combustion.

Now were it possible to control the power output by mixture strength alone, and still obtain complete combustion, it is clear that the maximum temperature would then be proportioned to the load and would diminish as the load is reduced. As the temperature diminished so also would the losses due to dissociation, change of specific heat, and direct heat loss diminish until at the point of no load and, therefore, of no heat supply, they would disappear entirely and the limiting efficiency would be virtually coincident with the air cycle. The accompanying curve (Fig. 6) shows how, under these conditions, the limiting thermal efficiency would vary with the load. In this diagram the horizontal line denotes the air-cycle efficiency, which, since it takes no account of heat losses, etc., is constant for all loads, the sloping line denotes the theoretical limiting efficiency over the range from no load to full load, the third line represents the limiting efficiency with minimum heat losses, and the fourth the actual test results obtained over the range of mixture strength available with a homogeneous charge. While it is not possible to weaken the mixture strength so long as the charge is homogeneous, it is possible to do so by means of stratification, that is to say, by supplying the cylinder with a relatively small charge

of combustible mixture and admitting separately a large charge of air, keeping the two separate until after ignition. To do this it is necessary to reconcile two conflicting conditions—the two portions of the charge must be prevented from mixing till after ignition, and at the same time there must be sufficient turbulence in the combustible charge to insure rapid combustion. These two conditions are not irreconcilable, and the writer has succeeded experimentally on two engines in obtaining the whole range from dead light to full load by controlling the fuel alone. Under these circumstances not only is the efficiency on reduced loads far higher than could be obtained by any other means, but the heat loss is so low that a water-cooled engine can be run at reduced loads for any length of time without cooling water.

The accompanying curve (Fig. 7) shows the efficiency actually obtained in one experimental engine with a compression ratio of only 5:1. It will be observed that it rises to no less than 37 per cent at about one-third full load corresponding to a fuel consumption of just under

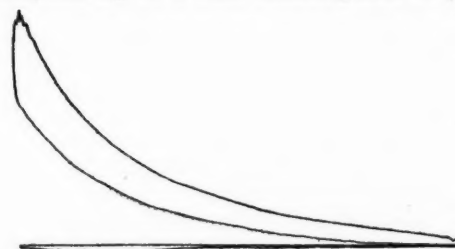


Fig. 8—Indicator card from experimental engine using excess air

0.36 pint of benzol per indicated horsepower-hour. It will be seen that the curve of efficiency actually obtained follows the theoretical curve with a reasonable degree of approximation. In Fig. 8 is shown a typical indicator diagram taken from one of the two engines with a Hopkinson optical indicator. It should be noted that when working on this system distribution troubles disappear. In any ordinary multi-cylinder engine it is necessary so to proportion the mixture that the weakest cylinder receives a charge of a certain minimum strength to insure regular running; this means that other cylinders are receiving a slightly richer charge than is absolutely

necessary and their efficiency is therefore reduced. On the other hand, when working with a stratified charge, the power output of each cylinder is dependent solely upon the quality of fuel admitted to it, so that any cylinder which receives a richer mixture than others will develop correspondingly more power, and the economy will always be at a maximum, that is assuming, of course, that the mixture strength is at all times below that required to consume the whole of the oxygen. Again, from the point of view of altitude compensation nothing could be simpler, for (so long as the oxygen in the cylinder is not all consumed) constant power can be maintained over any reasonable range of density by merely supplying a constant fuel feed, e.g., by gravity, or if a carbureter is used in its crudest form, the variation in power with altitude will correspond with the natural characteristic of the carbureter and will, therefore, vary as the square root of the density.

With a view to gaining further practical experience with this system, one of the two gas engines supplying power to the writer's laboratory was, about nine months ago, converted to run with stratified charge and control on the fuel alone. Since that date it has run continuously under violently fluctuating loads and has developed no trouble of any kind. It is running in parallel with another engine identical in every respect but working on the ordinary cycle. In the case of the latter engine it is necessary to remove the cylinder head every two months for decarbonizing and grinding in the exhaust valve, while the cylinder of the engine working on the stratified charge has only been opened once, when it was found to be practically clean, while the exhaust valve appeared to keep almost as cool as the inlet valve in the other engine. As regards governing and regularity of running there is nothing to choose between the two engines, each of which can develop a maximum of 24 brake horsepower at 750 r.p.m. Although the above experiments suggest that the system has been developed to a practical stage, the writer feels that this is hardly yet the case, and that considerably more research is required before it can be considered wholly satisfactory. In the writer's opinion the potentialities of working with a stratified charge cannot be over-estimated. It opens up the possibility of obtaining far higher efficiencies than are obtainable by any other known means, and what is perhaps equally important, it reduces the temperature of the cycle and with it all the troubles due to high temperatures which directly or indirectly are the root cause of most mechanical failures. Since the rate of heat flow to the cylinder walls varies roughly as the cube of temperature, and the power output practically directly as the temperature, it follows that quite a small reduction in power will reduce the heat losses to an extent that must render air-cooling quite a simple problem.

The possibilities of working with a short compression and long expansion stroke deserve careful consideration. In effect this can be accomplished by the simple expedient of closing the inlet valve late, so that compression does not start until well up the compression stroke; this method has both direct and indirect advantages. The direct advantages are that while the compression pressure is controlled by the nature of the fuel, the expansion ratio can be extended to any degree and very high efficiencies can be obtained, though, of course, at the expense of the power developed per unit of cylinder volume. For example, suppose that a fuel of 0 toluene value is used, then while the compression ratio is limited to 4.85:1 on the ground, the expansion ratio may be say 8:1. The limiting efficiency for 4.85:1 expansion is 32.7 per cent, and for 8:1, 40.6 per cent, the power output under these conditions will therefore be $4.85/8$ or 60

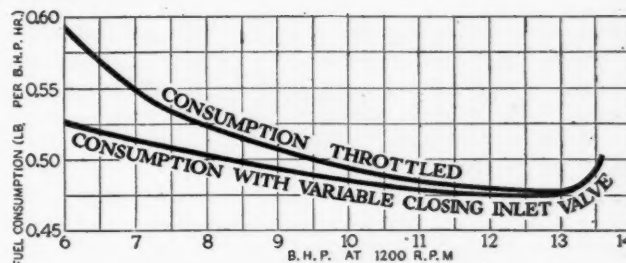


Fig. 9—Curves showing comparative fuel consumption when throttled and with late closing inlet valve

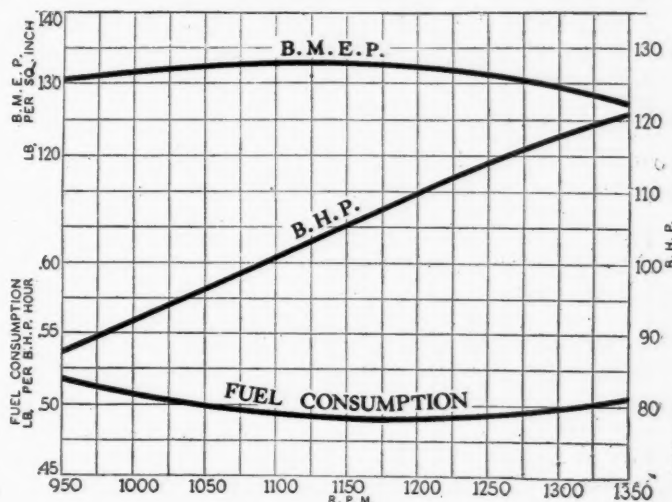


Fig. 10—Curve showing performance of 100 hp. single cylinder engine

per cent of that obtainable with an 8:1 compression, assuming that such a compression could be employed, or 73 per cent of that obtainable if both compression and expansion ratios were 4.85:1. By varying the time of closing of the inlet valve the compression could be increased as the machine ascended, until at about 15,000 ft. the full compression could be used and full power developed. Thus the indicated thermal efficiency could be maintained at a maximum and the power nearly constant over this range of altitude.

The indirect advantages are:

- (1) That with such a valve setting the engine has a rising torque curve which is a desirable characteristic.
- (2) In the event of one cylinder dropping out and the speed falling in consequence, the compression in the remaining cylinders is reduced, and the shocks due to the irregular turning moment are also reduced. When controlled by throttling, the reverse is the case; if one cylinder drops out the others, owing to the drop in speed, take in a heavier charge, resulting in severe shocks and increased liability to detonation and pre-ignition.
- (3) When working with a late-closing inlet valve the whole charge enters the cylinder and a portion is rejected. The rejected portion, which returns to the manifold, has picked up a considerable amount of heat from the inlet valves, cylinder walls and residual exhaust gases, some of which heat it imparts to the inlet manifold with the result that, as the load is reduced, so is the temperature of the manifold increased, which is a desirable characteristic.

Some years ago the writer carried out a series of experiments with a variable inlet cam fitted to a small engine having an expansion ratio of 5.95:1. A number of very careful comparative power and consumption tests were made, the power output of the engine being controlled in the one case by varying the time of closing of the inlet valve, and in the other by using a normal valve

setting and throttling the charge. The results obtained in these experiments are shown in Fig. 9, from which it will be observed that the gain in efficiency in the former case, though perhaps not so large, is none the less quite appreciable. It should be noted that in these experiments the same expansion ratio was used in both cases, so that the advantage due to prolonged expansion was not obtained, and the gain in economy recorded is that due to indirect advantages alone.

Designing for Best Performance at Given Density

In aircraft engines when one is working over a large range of atmospheric density the question always arises—at what density the engine shall be designed to give its best performance or at least to develop its full power. Until comparatively recently all engines were so designed that they could develop their full power at ground level, without pre-ignition, without overheating, and without overstressing the parts. During the war, however, it became evident that this was unnecessary and undesirable, and manufacturers were urged to design their engines on the assumption that they would not be opened wide below 10,000 ft. So far as the writer is aware, no manufacturers actually produced such an engine. It is, however, interesting to consider what might be done in this direction. We will begin with the assumption that modern aviation spirit has a toluene value of 10, which is about the average value of American aviation spirit. At 10,000 ft. the air density is 0.72, and at this density a compression ratio of 7.0:1 could be used with such a fuel, giving a theoretical limiting thermal efficiency of 38.8 per cent and a theoretical limiting mean pressure of approximately 165 lb. per square inch reckoned at ground level or 119 lb. per square inch at 10,000 ft. Under these conditions let us now consider what power the engine could develop at ground level, keeping just free from detonation. If controlled by throttling the maximum indicated mean pressure would be approximately 95 lb. per square inch. If controlled by varying the time of closing of the inlet valve it would be considerably higher, because for various reasons the efficiency obtainable under these conditions is greater and would be very nearly in the ratio of $5.25:7.0 \times 165$ (5.25 being the limiting ground level compression ratio for a fuel of toluene value 10) or say about 122 lb. per square inch. If controlled by the addition of cooled exhaust gas the mean effective pressure, as shown previously, would be very nearly equal to the full available M. E. P. with a compression ratio of 5.25:1 or 140 lb. per square inch.

In all cases let us assume that the mechanical losses of the engine are equivalent to an M. E. P. of 15 lb. (a fair average figure). Then the theoretical limiting brake mean pressure in the three cases would be:

- (1) 80 lb. per square inch.
- (2) 107 lb. per square inch.
- (3) 115 lb. per square inch, while at 10,000 ft. the brake M. E. P. will be 104 lb. in all cases.

Use of Exhaust Gas to Enable Higher Compression

In all three cases the explosion pressure would be substantially the same, and little or no higher than at 10,000 ft.—that is about 450 lb. to 500 lb. per square inch. In the latter case it will probably be actually lower, because the principal effect of the exhaust gas is to slow down the rate of burning and so round off the peak of the diagram. Assuming that the propeller torque varies as the square of the speed and directly as the density, then, if the engine is designed to run wide open at 10,000 ft. at 1500 r.p.m., its maximum speeds at ground level will be approximately 1100 r.p.m., 1270

r.p.m. and 1320 r.p.m., respectively. In the former case such an engine would probably fail to leave the ground.

From these considerations it seems clear that the principle of designing a very high compression engine for use at high altitudes and throttling it on or near the ground is not the right one. Of the three methods considered, the use of exhaust products appears to be the most hopeful as a means of permitting a very high compression engine to operate satisfactory at low altitudes, and still have sufficient power to get rapidly off the ground. The alternative method of dealing with the problem of varying atmospheric pressure is to maintain artificially ground level density in the cylinder at high altitudes by supercharging. From the point of view of engine weight there can be no doubt that this method scores heavily, for, although the strength and weight of many of the parts may be proportional to the density in the cylinder, there still remains a very considerable number whose weight is altogether independent of the pressure in the cylinder, so that the weight of the engine, as a whole, can only vary as the density plus a very large constant.

There are at least two possible ways of dealing with the supercharging problem, one by merely forcing more fuel and air into the cylinder by means of a pump or blower and the other by employing a supercharge of pure air in a stratified form. Some four years ago the writer carried out a very extensive series of tests on this latter system, and obtained most encouraging results on two experimental engines, but had to break off these experiments and concentrate all his attention on engines for tanks. The results obtained were, however, so encouraging that further tests should be made. Apart from the obvious increase in power at high altitudes this system of supercharging provides a perfect and automatic compensation of mixture strength for altitude, and gives a considerable increase in economy, the consumption falling from 0.49 lb. per brake horsepower-hour when running normally to 0.455 lb. when supercharging.

Limiting Size of Cylinder.—Designers of aircraft engines have, in the writer's opinion, shown quite unnecessary timidity in regard to the power output obtainable from individual cylinders. So far as the writer is aware no one has yet had the courage to construct an aero engine with cylinders developing more than 50 hp. each. Some two and a half years ago, as a result of experience with large cylinders on tank engines, the writer was requested by the Air Board to design an engine for aircraft to develop 100 hp. per cylinder. A complete design was prepared, and after much delay a single cylinder unit was built at Farnborough having a bore of 204 mm. and a stroke of 280 mm. This unit has been running on and off for over a year. Apart from a failure of the valve gear at first which has never been quite explained, it has given very little trouble and no trouble at all which can be attributed to its large size. In view of the fact that its compression ratio is only 4.84:1, the results obtained are rather extraordinary and constitute, the writer believes, quite a record for so low a compression. From the accompanying curves, Fig. 10, it will be observed that this single-cylinder unit develops 120 brake horsepower when running at 1350 r.p.m. with a consumption of only 0.493 lb. per brake horsepower-hour at its normal speed of 1250 r.p.m., corresponding to an indicated thermal efficiency of 31.2 per cent, or within 4 per cent of the limiting value for this compression and an indicated mean pressure of 150 lb. per square inch. These results will, the writer hopes, help to dispose of the myth that very large cylinders can only operate with relatively low mean pressures and at a low efficiency.

Time Study Work Requires High Grade Men

A prominent industrial engineer points out that the time study man is the connecting link between the management and the working force; that he reflects the policies and attitude of the employer. He believes that the time study man is important in the adjustment of industrial relationships.

By William Baum

LOOKING into the future of shop and factory methods, William Baum, industrial engineer for a large textile concern in Milwaukee, and consultant for a number of Milwaukee industries, says that co-operation in time studies and organization methods between employer and employee, even to the extent of sharing the expense, will be found necessary. Both sides must see that time study is highly ethical, and is for the purpose of determining the time required to perform an operation which will be fair and just to employee and employer.

Mr. Baum's views, as expressed recently before the Society of Industrial Engineers of America hinge on the importance of training of time study men at this time in the light of future conditions in the labor and production situation, and are in substance as follows:

"The importance of standardization and scientific wage systems based upon time and motion studies is well understood by progressive industrial managers, who begin to reap the great benefit derived from the introduction of scientific management systems. Wherever such systems have been installed by responsible and competent engineers they have resulted in greater production, lower unit costs and higher wages.

"The men charged with the important task of making time studies must be qualified to make an analysis of manual, mental or machine processes into the smallest elements; to eliminate waste of time, energy, tools and health; to establish proper allowances for fatigue and unavoidable delays, and to determine the one best way of operation and process. It can be readily seen that the skillful handling of the stop watch is not the only factor which enters into the training of time study men.

"Their training should be as broad as possible. In many years of training of time study men I have found that the graduate mechanical, electrical or chemical engineer makes the best time study man, especially if he has had some shop practice. The college man has the advantage that his mind has been trained to take accurate observations in the physical and chemical laboratory. It is this foundation of thinking and working scientifically which enables him to learn and master the intricacies of industrial time study work in a comparatively short time.

If engineering students in our colleges could be given an opportunity to attend courses and laboratories on time studies, using proper text books, they would be amply prepared to take up the work in the industries. Herrick's Class Book would be proper.

"As the matter now stands, most successful industrial engineers train their own forces, not according to hard

and fast rules, but by letting them 'go through the mill.'

"The training of time study men is not only a matter of teaching the technique of the art. In practice the time study man is the connecting link between the management and the working force. He reflects voluntarily or involuntarily the policies and the attitude of the employer which reacts in one or the other way upon the man in the shop. If the time study man has a broad conception of his position, he will have the desire to be a servant to both his employer and the employee. After all, the object of taking time study is a highly ethical one—to determine the time which is required to perform an operation and which is considered fair and just to employees and employer.

"Most labor disputes hinge on wage questions and can be reduced to a minimum only if the basis for setting the rates is correct, represents the truth and is indorsed by the one who works and the one for whom the work is done. In fact, the time may not be far off when the industrial engineer and his time study assistants will be the true servants to both management and working force, and as such be paid in equal proportions by both parties. The garment workers in Cleveland have already set an example.

"There is no group of workers or a self-respecting union which could afford to reject or resent time studies if such work is done in absolute fairness to the men as well as to the company. Naturally, when the time-study engineer is the personal emissary of the manager, suspicion arises among the workers, who see in the time-study man only a driver, an intruding observer of their work. Let the time-study man be the unbiased friend to both workers and management, employed and paid for by both, and the results will be most satisfactory from a production view as well as industrial relationship.

"The success or failure of any scientific wage system will depend not only upon the characteristics of any system to fit existing conditions but also upon the skill and particularly upon the personality of the time-study man. In his mind must be instilled the highest principles of professional ethics, integrity and honesty. If he is earnestly interested in the welfare of the workers, understands human nature and is willing to stand for the truth under all circumstances, he will secure the trust and confidence of all men and women who see in him their friend and adviser."

THE automobile carries, at some stage, practically all of the products of the steel mills and tons of freight carried by the railroads.

Edge Act Corporation Proposes to Finance Foreign Trade

The attention of manufacturers interested in export development is directed to a statement of the proposed Export Trade Financing Corporation, which is inviting purchase of stock. This banking institution proposes to finance America's trade abroad.

AN interesting and important development in the export field is that of the opening of the stock subscription books of the Foreign Trade Financing Corp. The proposal to organize this corporation is based on the Edge Act, an amendment to the Federal Reserve Act. This amendment is practically authority for American banking interests to extend their financing to foreign countries when necessary to aid American trade. The Edge Act is complementary to the Webb Act. Under the Webb Act several manufacturers could form a sales company and this company could act as sales agent abroad for lines so closely related that they would be considered competitive in this country.

The Edge Act does not authorize selling companies but applies similarly to the banking feature. This corporation will not sell, nor will it supplant abroad the branches of American banks. It will rather serve as a Federal Reserve Bank for the foreign deals of the banks and selling companies. It will aid rather than supplant the branch banks.

This company was tentatively formed at the annual meeting of the American Bankers' Association at Washington last October. The next step was taken at Chicago Dec. 10 and 11, last year, when the heads of many national trade societies met at the call of the president of the American Bankers' Association. At that meeting it was decided to invite W. P. G. Harding, Governor of the Federal Reserve Bank, to become head of this corporation. The importance of this proposed organization can be judged by the fact that Mr. Harding has accepted this invitation.

The Foreign Trade Financing Corp. proposes to raise \$100,000,000 by selling stock. With this stock sale return as a beginning, deals will be extended by the sale of debentures, based upon loans made to finance foreign trade. The sale of these debentures will supply capital, it is said, to the extent of \$1,100,000,000 total, if that amount is required.

It is announced that the capital of the corporation will be used to aid the industries that subscribe for it. In other words, if the automotive industry subscribes heavily to this stock, it will be used for automotive loans in proportion, if it is needed.

This corporation is not merely a friendly aid society. It will make a profit on its deals. Banks, manufacturers and individuals are invited to subscribe for stock. Its object, however, is to be helpful in distributing the overproduction of raw materials in America to countries where the raw material is required, and to finance the manufacture of this raw material into finished products. The Committee on Organization of the Corporation includes many bankers and leaders in national trade organizations. J. G. Culbertson, John J.

Raskob and Roy D. Chapin of the automotive industries are members. Communications regarding the purchase of stock should be addressed to Committee on Organization, 66 Broadway, New York.

British Body Work

THE Wellington (New Zealand) correspondent of the *London Times*, after noting a large increase of value in the motor imports of the Colony during the first eight months of 1920—the value of this increase being about \$5,700,000—mentions that a belated delivery of cars was then taking place, and that *the percentage of British and European cars and cycles is very small*. He adds the important remark that *the American cars are of the class which the market requires, and that some recent arrivals of British cars had been a disappointment as regards the bodywork*. Apparently he means this criticism to apply to British cars of the type intended to compete with the American models which have the largest sale.

He eulogizes British trucks, which he thinks cannot be ousted by rivals, and notes that there is a growing market for trucks, especially among farmers, dairymen, etc.

Merchandising Abroad

DURING recent months many American business men have visited Europe and upon their return each one has told of his impressions. Very often these impressions have had to do largely with the political and international aspects of the situation "over there," and, while interesting to a certain extent, have not given much food for thought in connection with the immediate practical activities of other American manufacturers.

Like others who have gone abroad since the armistice was signed, E. V. Hennecke, of the Motometer Co., Inc., who recently returned from several months in England and France, was impressed with the economic significance of certain aspects of the political situation. He gained also, however, some interesting and definite impressions as regards business and merchandising methods, which have a rather direct bearing upon some of the foreign trade problems now confronting other automotive manufacturers.

One factor not sufficiently recognized usually by American manufacturers in attempting to merchandise their product in England, is the difference between our system of distribution and the system commonly used in Britain. In the case of automobile accessories, for instance, it is common over here to market through a jobber and then through a dealer. In England, however, the manufacturer usually sells direct to the dealers or the jobber sells directly to the consumer. In other words, one distribution unit is eliminated. This is made pos-

sible chiefly by the smaller area over which distribution takes place and partly by long established custom.

Merchandising organization, moreover, has not been carried to so great a degree of refinement as in this country, although British and French manufacturers are rapidly improving in this respect. Many of them are molding their advertising catalogues and their merchandising efforts along the lines generally used in this country, and they may be expected to equal us in this respect before many years have passed.

On the other hand, Hennecke found, merchandising cannot be conducted on the rapid, aggressive manner that is common in America. Things just don't move that fast in England and French business. Many American manufacturers have expended a great deal of useless money in trying to merchandise in these countries exactly as they have successfully done at home. They have expected too rapid results, and as a result have often obtained few results at all.

The American manufacturer needs a very thorough knowledge of the customs and methods used in England or France if he is to attempt to conduct his own merchandising campaign. In many cases he will do better to get a native Englishman to conduct his entire selling campaign for him—making certain, of course, that he has chosen a competent and efficient representative. This is often good policy for several other reasons.

In England, for instance, Hennecke found that the trade-mark "Made in U. S. A." is almost a certain bar to the sale of a product at the present time. This is true, he says, even in regard to consumer sales. The unfavorable rate of exchange is, of course, one reason for this condition, but there is also a strong prejudice against American goods because America bids fair to take away from the British their former economic domination. It is surprising to note the pride taken by the average Englishman in the trade superiority of his country.

When the American product is manufactured in England, however, much of this prejudice is dissipated, since the Englishman then feels more favorable toward it since English labor is being used in making it and taxes on the profits are paid to help support the English government.

In France, however, the situation appears to be different. There is a great love for America and the trade mark "Made in U. S. A." is a help to the sale of goods despite the extremely unfavorable rate of exchange.

There are often local peculiarities which have a very definite bearing upon the sale of an American article in foreign countries, and the American manufacturer who attempts to merchandise without a thorough understanding of local conditions is very likely to fail in his efforts without ever being able to understand the real causes for his lack of success. Hennecke cited an example of this in connection with the product of his own company, the motometer.

He found that in England there are two very powerful automobile clubs, the R. A. C. and the A. A. A., both of which use a special insignia placed on the top of the radiator cap. This insignia is not only ornamental, but entitles members to certain desirable privileges while touring, and is considered by members of these societies as a very essential part of their motor equipment. Obviously, this fact creates an increased sales resistance for the motometer and constitutes one of the factors which must be overcome in merchandising.

This instance is cited simply as an example of the kind of local condition which is likely to make merchandising difficult for any specific product in a particu-

lar case. It emphasizes the need for a close analysis of markets before the investment of capital in selling effort.

Speaking of general conditions in the automotive industry in England and France, Hennecke stated that he found things very dull in practically every instance. Many of the English plants were entirely shut down, while those in operation were proceeding on greatly curtailed schedule. Optimism prevailed throughout the trade, however, and an early return to normal is expected.

The accessories business in these countries is not developed to nearly so high a degree as in America, and there is an excellent opportunity for American manufacturers in this line of automotive equipment.

Hennecke got one very vivid impression during his stay in France. It was the apparent determination of the French people to get to work and repair the damage done by the war. Everyone there, he said, seemed to be filled with a spirit of industry and there seemed to be a strong individual, as well as general, effort to get to work and stay at work. There appeared to be less industrial unrest in France than in England.

A Britisher's Opinion

AMERICAN engineers might well be interested in this comment by A. J. Hancock, works manager of the Vauxhall Motors, a well-known British plant. This comment was made after a visit to America, which included a number of factories. The comment follows:

"As a result of my visit I am not despondent over England's future," said Mr. Hancock. "What I have seen simply means that the English must work just a shade harder in industry, and that people of our working class need to lend themselves to the arts of quantity production in a manner they are now disinclined to adopt.

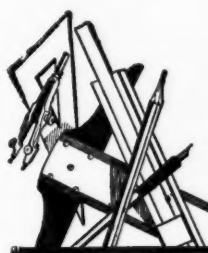
"It is a revelation to see able-bodied workmen in America doing repetition work so fast and with such apparent interest. They do it much faster than the English worker who uses the same appliances. We must change this in England in order to hold our place against American competition in the world markets. American enterprise rides to a big gain or a big fall. American capitalists take bigger risks. For instance, the heads of a firm will say: 'Let us lay down a million more feet of floor space' as readily as English business men would say: 'Let us lay down a thousand feet.' I am of opinion that America has lost the sense of the ideal in its successful search for quantity production.

"The better classes of American motor cars lack the simplicity of design and the taste in finish that characterize the English product. If we were to take over the manufacture of some of the best-known trans-Atlantic motor cars we would simplify the design and do away with many parts. For instance, Vauxhall cars, at the present rate of exchange, are priced in the neighborhood of \$4,000. Compared with American cars in this price category they will do all United States products will do, at less expense, with less complication; and they are a perfectly turned out job. Many American cars of the better class are too heavy, and are extravagant in the use of fuel.

"I am perplexed over the fuel situation. In our country the high cost of gasoline compels economy. Motor design of the future must turn toward more economical motors. If every motor car—every Ford car, even—was to have its fuel consumption reduced 10 per cent the price of gasoline would drop 50 per cent. Automotive engineers will solve the problem. A fuel consumption of between 30 and 40 miles to the gallon is not improbable for the middle size touring car of the future."

Exports of Automobiles and Tires for November, 1920

COUNTRIES	—Commercial—		—Passenger—		Parts	—Tires—			All other				
	Complete Cars	Chassis	Complete Cars	Chassis		Inner	Casings	Solid					
Europe:													
Austria	1	\$ 5,764	6	\$ 6,000	\$76	\$ 170	\$ 83,433	\$ 14,884	\$ 2,371				
Azores and Madeira Islands			89	157,284	17,606	116	1,525	449	18,200				
Belgium													
Bulgaria													
Czechoslovakia													
Denmark			38	63,378	450,483	16,893	120						
Finland	15	20,983	7	9,320	744	13,768	650		2,371				
France	1	1,500	60	101,121	578,861	171,414	2,261		18,200				
Germany			4	5,400	1,488	17,212	6,532		20				
Gibraltar			2	3,478	15,366	12,250	916	372					
Greece	5	10,384	79	106,203									
Hungary					1,773								
Iceland and Faroe Islands			34	38,260	10,344	148,784	21,785		2,902				
Italy			4	4,948		895	80						
Malta, Gozo, and Cyprus Islands					19,655	104,520	19,463		40				
Netherlands	46	40,952	2	3,885	51,241	77,563	4,923	2,191	1,171				
Norway	41	125,126	4	8,760	5,218	9,362	1,530						
Poland and Danzig			16	22,480	15,359	8,102	6,000	213	26				
Portugal			7	13,018	10,337	19,805	4,657	4,867					
Roumania			102	58,903	216								
Russia in Europe	49	63,358	3	5,315	593,511	100,815	7,243		305				
Spain	39	71,260	28	45,933	65,422	22,855	8,109	900	4,879				
Sweden			317	423,239	11,596	12,960	499						
Switzerland			177	226,648	15,861	11,766	6,566						
Turkey in Europe	22	17,826	150	152,612	2,169,162	249,591	42,116		298				
England	100	161,754	58	133,358	655,689	17,949	4,829	1,679					
Scotland			2	2,900	3,724								
Ireland			78	38,272									
Yugoslavia, Albania, etc.						5,456							
North and South America:													
Bermuda	1	1,595	1	545	1,841	115	72						
British Honduras	39	78,474	10	23,845	589,229	171,767	18,076	6,811	3,406				
Canada	4	4,738	1	3,016	3,536	593		1,680	4				
Costa Rica	2	5,000	5	10,901	6,588	2,779	114		371				
Guatemala	3	3,295	1	1,919	5,323	611	62						
Honduras	2	4,300			4,862		38	297	505				
Nicaragua	8	7,702			16,903	5,435	2,418	2,191	422				
Panama	1	3,810	1	3,996	10,242	10,413	1,378	4,500	443				
Salvador													
Greenland	136	214,332	22	53,342	116,517	204,487	41,997	10,887					
Mexico					5	2,500							
Miquelon, Langley, etc.													
Newfoundland and Labrador	9	11,398			2	1,900		253	750				
Barbados	20	11,510	2	1,596									
Jamaica	2	20,175			3,230	2,366	214		67				
Trinidad and Tobago	3	7,000	42	29,835	26,840	4,257	1,010	2,349	507				
Other British West Indies	2	1,465	1	528	25,894	1,749	504	1,061					
Cuba	176	556,803	90	350,011	2,963	1,212	132		1,232				
Virgin Islands of U. S.					367,407	312,614	33,867	97,292	5,023				
Dutch West Indies					2,019	2,934	331		21				
French West Indies					3	1,484	2,305	207					
Haiti					24	24,869	8,674	2,219					
Dominican Republic	15	22,229			1	500	5,146	7,857					
Argentina	7	18,384	20	81,977	43	53,163	32,217	22,948	918				
Bolivia	1	2,500	2	4,687	469	653,260	5	11,280	1,307				
Brazil	85	57,055	15	43,533	3	11,650	1,603	1,952	2,475				
Chile	25	26,985	10	29,849	582	737,908	12	27,036	358				
Colombia	39	30,632	21	40,739	34	53,414	2	10,000	3,502				
Ecuador	7	21,136	3	6,750	73	130,349	3	7,617	2,383				
Falkland Islands					18	29,916			300				
British Guiana	2	5,115	6	2,920	15	10,245	1	433	205				
Dutch Guiana			1	1,261	1	536			59				
French Guiana													
Paraguay													
Peru	122	65,569	10	5,100									
Uruguay	35	18,282			150	122,056	7	4,867					
Venezuela			1	1,494	355	390,417	24	12,130					
Asia and Far East:					93	96,313	1	1,713					
Aden	2	7,188											
China	6	19,056	4	14,415	11	10,301		3,042					
Kwantung, leased territory					148	207,539	13	23,752					
Chosen													
British India	101	210,479	38	102,271									
Straits Settlements	66	127,459	16	20,833	692	977,184	4	5,457					
Other British East Indies	16	31,290	4	12,566	154	222,157	2	1,624					
Dutch East Indies	136	377,349	89	245,187	35	47,633							
French Indo China	15	11,245	4	4,428	806	1,127,665	38	115,413					
Hongkong					96	103,032							
Japan	2	7,496	32	71,811	15	31,124							
Persia					51	102,199	10	11,848					
Siam													
Turkey in Asia	1	2,532			18	19,601							
Australia	15	33,070	45	64,026	88	91,958							
New Zealand	30	77,633	25	54,490	201	270,581	650	680,106					
Other British Oceania					666	864,158	61	80,023					
French Oceania	1	1,350											
Other Oceania					2	1,600							
Philippine Islands	78	147,272	46	84,325	1	975							
Africa:					6	32,500							
Belgian Congo													
British West Africa	77	107,847	19	30,983									
British South Africa	4	5,538	4	9,327	42	61,913	2	4,488					
British East Africa	4	7,816			501	623,535	2	3,163					
Canary Islands	2	6,456			102	108,399							
French Africa	2	2,170			8	9,373							
Liberia					52	57,300							
Morocco													
Portuguese Africa	6	6,604			43	53,345							
Egypt	6	4,425			28	32,842							
Non-contiguous Territories:					176	153,170							
Hawaii													
Porto Rico													
Total	1,635	\$2,921,666	695	\$1,635,719	10,581	\$13,406,552	905	\$1,105,204	\$8,480,615	\$3,717,751	\$511,219	\$286,266	\$31,898



The FORUM



Transmission Brakes

Editor AUTOMOTIVE INDUSTRIES: Viewed from the standpoint of those who live or drive in mountainous sections, the transmission brake should be the emergency brake. If both brakes operated on the shaft, with the service brake arranged as the less powerful one, it would be better than the two wheel brakes on many present cars and fully as safe as the latter.

The transmission brake distributes the retarding effort more equally than is possible with wheel brakes under varying load—and loads are rarely constant. But where there are long descents, the heat from constant application of the shaft service brakes frequently sets fire to the floor boards. Hence, for driving in hilly country the transmission brake is better when actuated by the hand lever.

There is no good reason why wheel brakes could not be of as high a grade of design as other parts of a car or why the external brakes could not be partially enclosed at little expense. The transmission brake has undoubtedly received more attention from its position and general environment, being a part of the unit power plant in many cases and directly related to other members which are better made and run truer than wheel parts.

So long as we tolerate that mechanical misfit—the Hotchkiss drive—so long shall we have shaft brakes. Of course, there are and have been Hotchkiss drive cars of an otherwise high grade that were fitted with wheel brakes only. The writer has yet to see one of these cars that you could be sure of holding if you had to stop when ascending a steep hill; if the brakes were adjusted for good service in a forward direction, you could push them to the floor board without stopping the car from rolling backwards. The same is true if the adjustment is made with a full load and the brakes are put to the test with but a fraction of this. This becomes a serious matter where there are frequent or long hills with grades of seven per cent or more—particularly if the traffic is heavy. Under such circumstances, the shaft brake is one's only salvation.

DONALD A. HAMPSON.

Urging Wood Conservation

Immediately on reading the editorial on "Wood Conservation" in the issue of AUTOMOTIVE INDUSTRIES of Jan. 6 Cornelius T. Myers addressed the following letter to the members of congress to whom he feels entitled to express his views. We commend this course of action to other engineers and to manufacturers.

Hon. Earnest R. Ackerman,

I wish to write you in behalf of an appropriation of \$400,000 which the Forest Products Laboratory at Madison is seeking in order to carry on its work the coming year.

I am personally acquainted with some of the work which has been done and some of the proposed program, and can say that it is not only theoretically constructive, but has been of great practical value to the wood working industry.

I appreciate and am in accord with the efforts of Congress to decrease governmental expenses to the minimum

for the next few years, but would greatly deplore any economy with respect to so important a function as is being performed by the Forest Products Laboratory, which is, as you know, a branch of the Forest Service of the Department of Agriculture.

The value of the products of the wood working and using industries aggregates about ten billion dollars annually and these industries employ as many men as any other single industry in this country. It is conservatively estimated that the commercial application of the research work already done by the Forest Products Laboratory is saving the country thirty million dollars annually. To do other than appropriate money to continue so vital a work would be equivalent to letting your furnace fire go out in order to reduce the coal bill.

I can speak personally for the work of the Forest Products Laboratory and its very capable staff, and trust that you will give your personal attention to this item, both in committee and on the floor of Congress.

Rahway, N. J.

CORNELIUS T. MYERS.

Action on Patent Bills Urgent

Editor AUTOMOTIVE INDUSTRIES:

For more than a generation there has been a constant petitioning of Congress to enact a law that would permit the Patent Office to use the money earned by it to promote the interests of patents. The patrons of the patent office are entitled to this service, as they pay for it. The refusal to permit this has caused to be returned to the United States Government more than \$8,000,000 as profit. The men of long experience who worked so hard to make the Patent Office a success are gone—starved out. Men who can pass the required examinations will not take the places open at the salaries attached. The work is increasing 20 per cent a year since the war and the ablest men in the Patent Office are leaving it at the rate of 2 per cent a month. Our Patent Office is a wreck!

Erroneous and invalid patents are rushed through in an attempt to keep up with the work. These later clog the courts and cost the people much money. Assignments are a year behind the record clerks. One hundred and twenty thousand patents await action! Buyers of patents cannot ascertain titles. Copies of patents cannot be obtained because the records are lost or out of print.

And all because Congress does not authorize the money to hire enough men and pay enough to get them.

For a year the Nolan bill, H.R. 11,984, has been dragging along. Another 25 per cent of the best men have gone while it dragged. It has passed both Houses of Congress with some amendments and now has been passed by the Conference Committee and reported back to both Houses. A vote is expected in the House during the closing days of Congress. Every manufacturer, engineer and production man should urge its passage. Failure to pass this bill will lose another year and cost untold millions that the new business lodged in the Patent Office should and can bring. This is important to you.

CHAS. E. DURYEA.

Since this letter was written the Nolan Bill has been passed by the House of Representatives, but has not yet been brought up by the Senate.

Mutual Benefit Should Be Major Thought in Dealer Contract

What is written here is not startling in any degree. There is not anything new in the faultfinding with the manufacturer-dealer contract in the automotive industry. It is merely a part of the growing pains. Next—what is the importance of the dealer in the trade?

By Clyde Jennings

THE recent announcement that a committee of the National Automobile Chamber of Commerce will meet with a committee of the National Automobile Dealers Association and discuss the relations of dealer and manufacturer is certainly reassuring. It is not to be supposed that this committee will draw a model contract and that instantly the present defects will be remedied by all manufacturers and distributors adopting a standard of dealing.

This will not be the result, nor can it be the result. The members of the two committees will not have the power to bind all of their members to a certain contract, nor would this be desirable. These committeemen, however, can have a considerable power for good. The contract which is the connecting link between the dealer and his source of supply of merchandise has been the subject of much criticism and of, perhaps, more misunderstanding. Both dealers and manufacturers' salesmen are human and their relations have been and will be subject to the misunderstandings that constantly arise in human organizations. It will be within the power of the men serving on this committee to point out some of the injustice suffered by their fellows and then carry the other side's story back to their membership. Such a move will undoubtedly serve a good end. Usually the terms of a contract become a subject of a dispute after both parties are angry and in no fit humor for proper consideration of a business proposition.

It is not the intention of this article to assert that all contracts are bad, nor that all are good. Indeed, the existing contracts appear to be on both sides of the fence. It is, perhaps, more important to regulate the spirit that carries out the contract than to regulate the contract itself. In this phase of the situation, the joint committee undoubtedly can have a very marked influence for a better understanding. The representatives of the two great national bodies should have the nerve to speak out to their fellow membership if their conferences develop marked evils.

This article is not going to present for your consideration a model contract. We do not believe there is such a thing, nor that any one contract will serve the needs of all manufacturers. Rather it is hoped to offer some remarks on contracts in general. These will apply to all contracts, just as they will to manufacturer-dealer contracts. Before attempting to write this article, I had an audience with a man who has been dealing with contracts in a large way for a number of years. He is not a lawyer, in fact does not pretend to know anything of law terms or of the technical effect of contracts. He says that these things are detail, in which he has no in-

terest. He cares not so much for the exact wording of a contract as for the spirit of the contract. After leaving this man I held in mind a number of contract epigrams, and perhaps his views can best be expressed in this form. So here are some of his remarks.

A contract must be good to both parties. It must be fair.

A perfectly written contract is illegal if it is unjust and will be abrogated when brought into court.

Our contracts do not work so much on law as on justice and the man who brings a contract into court to enforce its terms must come with clean hands.

A contract to live must take into consideration a proper profit for both parties and must be so carried out regardless of the letter of the contract.

Business is not selfish; it is co-operative. No business can thrive on the losses of those connected with that business.

Honesty is the best policy. That saying has lived too long to be doubted. It is based on policy, or practice, and not on a moral foundation. Honesty is not and cannot be the mere living in keeping with a writing, but honesty must take into consideration the surroundings.

Of course this man had something more to say out of the wisdom that he has gathered in his long years in big business. It has been a part of his experience to take over several businesses that were in rather bad position. He has found it necessary, under these circumstances, to cancel many contracts. His belief in the native honesty of the average man has been greatly strengthened by these experiences. He did not notify the holders of these contracts of the cancellation, but he called them in to discuss the contract. He pointed out wherein these contracts were selfish, how they put an impossible handicap on the business and other things that we all know creep into contracts. Invariably he has found the man willing, in the end, to cancel his own contract. Often it required time for the man to think it over. Usually the holder of a selfish contract stiffened with opposition when the suggestion was made, and then realized his unfair position. He also realized that the success of the business was more important, even as regards himself, than his individual prosperity for a short period.

Let it be said here that the writer holds no brief for the manufacturer or the dealer in this contract discussion. It is quite well established that the dealer has suffered in many instances. Also it is established be-

yond question that the manufacturer has been the victim of the sharp practice dealer. The fault is not on one side. There are manufacturers who have not had a serious disagreement with a dealer in 15 years of merchandising. The dealers who have quit this service have left with good feeling. There are dealers who have sold for the same factory for 20 years and who assert that the factory management is entirely fair and reasonable; while other dealers have quit this same factory in a rage and later spread bad reports about the dealer relationships.

Recently a now prosperous New England dealer told of 19 years of service in the sale of a single car. Thrice during that period the ownership of the sales agency changed. Once because the dealer thought he did not get a square deal. Another time because the factory was not satisfied. The third time was when this employee bought into the sales agency, which he now controls. He says that during this period he has held steadfastly to the opinion that the factory sales department was entirely just in intent, and it was only necessary to properly present any particular incident to get justice. At the same time it has been the writer's experience to hear factory men speak of dealers as "foolish children" and in worse sounding terms. These are merely suggestions to indicate that no one rule will cure all ills.

Now for a moment we will return to the man of big business and his epigrams. Consider the first:

A contract must be good to both parties. It must be fair.

A recent communication tells of a factory making a contract that never had a chance. The factory was oversold at the time the contract was made. No effort was under way to increase production. This man required the profits on 100 cars a season to justify his establishment. He was promised 400. He received less than 50. Was that contract "good for both parties?" Turn it around. Is it "good for both parties" if a man enters into a contract to sell 100 cars a season, then buys one himself, sells one each to half a dozen relatives and then lays down on his job? Manufacturers will tell you of experiences of this kind.

New circumstances always will arise that are foreign to any clauses in the contract. No one ever imagined that in the winter of 1919 there would be hundreds of cars stored in the manufacturing district that could not be delivered before the buying wave exhausted itself. Some manufacturers realized the importance of this position when it developed, and, although it was foreign to the contract, assisted dealers in financing these cars. Some manufacturers did not. We ask you: Was it fair to hold the dealer to the letter of a contract when entirely unexpected circumstances arose?

Another of the epigrams:

A perfectly written contract is illegal if it is unjust and will be abrogated when brought into court.

The man of business illustrated this point in this way. During the war scarcity of raw materials he was forced by a very large company to sign a contract for \$2,000,000 worth of material necessary to his business in order to obtain delivery. No price was named. The seller was to make the price at the time of delivery. "This was unfair," said my informant, "but I signed under duress. At once we began to lay plans for our own source of raw material. We are now in a safe position. When the market began to fall I cancelled this contract, because it was 'unfair.' I was willing to go into court. But the other party to this contract knew that it was unfair and was entirely unwilling to carry it into court, although

the document probably was a model from a legal point of view."

Our courts do not work so much on law as on justice, and the man who brings a contract into court to enforce its terms must come with clean hands.

We hear much of law decisions that are based solely on the technicalities of the law. But the very fact that we hear so much of these few cases is an argument that court procedure—in the main—is based on justice. There are thousands of court decisions handed down daily. We hear little of the 999, but we do hear of the 1000th, which is the exception. Routine is not news. We would not read a newspaper that told only of the routine of life of the day laborer, or the busy, singing housewife in her house dress. We want to read of the man who is arrested, of the woman in gay clothing. Law decisions are no exception in news.

A contract to live must take into consideration a proper profit for both parties and must be so carried out regardless of the letter of the contract.

Comment on this would appear to be superfluous. Dealer franchises must always be based on production. The size of the town, the dealer expense, the opposition and other things must enter into the composition of a contract.

What good can it do a factory to have a large dealer list if the men whose names are on this list are standing in the financial soup line of their respective towns? The local customer judges the company by its dealer representation, not by the factory that he never saw.

Business is not selfish; it is co-operative.

The comment here is the same as just offered. The dealer who is not making money is not an asset to a factory. If it is the factory's fault, extra means must be taken to keep him satisfied. If it is the dealer's fault, eliminate him. Remember Roosevelt's utterance: "Speak softly, but carry a big stick." But if the contract is badly made, the factory cannot make a big stick out of it.

Honesty is the best policy.

All of us have seen so many organizations fail which were built on trickery and false pretense that we always wonder why men continue to "put it over."

A contract is necessary as a business memorandum. It should be just that. It should be a business agreement which can be shown to the banker to enable the dealer to obtain proper loans. His tenure as a dealer should be sensibly defined. If there is a penalty clause for one party, there should be a penalty clause for the other. It must be a mutual agreement to guide certain transactions, which gives to both parties an opportunity to be honest and prosperous. Then there should be the proper spirit behind it.

AN interesting motion picture, tracing the development of the gasoline engine and means of transportation, has been produced by the Cole Motor Co. The film has been named "The Porcelain Lamp" and had its premier showing at the Strand Theater during Show Week in New York.

The film pictures in dramatic manner the discovery of gasoline, the various modes of transportation from the time man had only his legs as a means of conveyance, the stages of development of the gasoline engine, and the development of the modern automobile. An interesting story is woven about that part of the picture which concerns the discovery of gasoline, and in the story a porcelain lamp plays an important part.

Workmen Feel Just Like the Rest of Us As Regards Wage Cuts

It is not surprising that the worker is putting up a fight against wage reductions. The history of the long division between labor and capital bears strongly on the matter, as does the amount and type of information available to the average worker. No man receives a cut in his earnings without raising some kick about it and determining to replace it.

By Harry Tipper

A LETTER which has been received this week affords us an opportunity to deal again with a matter that has formed the subject of several of these articles. This letter states:

"The fact that labor is walking out immediately when they think they have the manufacturer in their power because of returning business is certainly striking a blow at any spirit of co-operation that might have been engendered in the heart of the manufacturers by the fact that they were compelled against their wishes to cut their wages. Without any bias and looking at the matter in a calm, unprejudiced way, manufacturers certainly made every effort to maintain wages. These were cut only as a last resort and the workmen certainly ought to know it. The fact that this is not appreciated by labor generally, as shown by the current strikes, in spite of the fact that thousands of people are out of employment, has greatly disappointed the employers and manufacturers here."

This statement indicates the lack of appreciation by the manufacturers as to the consequences of the long division of capital and labor, as these statements are ordinarily used. It was pointed out in these articles some time ago that the workers are not inclined to be any fairer in their approach to the labor question than the employers. In fact, with their ignorance of many of the factors entering into the situation, the kind of information they have and their desire for larger comfort they can be expected to retain any advantage they have gained as long as possible and combat any reduction in that advantage.

We have pointed out in these articles from time to time that the removal of suspicion of long standing is not to be accomplished in a few months or a few days, and that the difficulties in the way of agreement between employers and employees cannot be wiped out by a few efforts and a gesture or two.

The manufacturer is very apt to assume—because he knows his prices are being reduced at a more rapid pace than his costs—the worker should be equally well informed and accept the situation with as much resignation. The worker, however, is not equally well informed, what opinion he has does not agree with the manufacturer's information at all. A significant example of this difference was shown in the hearing before the Labor Board some time ago when the four brotherhoods brought up the question of wages.

Mr. Lauck, the attorney for these brotherhoods, brought in a brief which was very ably worded and

thoroughly arranged. It purported to show that, while wages had increased approximately 100 per cent on the average, industrial returns had increased from 3 to 500 per cent on the capital. This brief was worked out so thoroughly that very few manufacturers would be possessed of sufficient information to refute the arguments and statistics contained therein. Mr. Lauck is a very prominent figure in labor circles. His arguments have been used and reused in the publications reaching labor and in the union meetings.

This is only one instance of the kind of information which the worker is securing in respect of the relation between wages and profits and between wages and cost. The information which has been given to the workers on this matter has been worked out more ably and carefully than any information from other sources and certainly it has been of far greater interest to them than any information supplied by their employers.

But this is not the most important reason for the attitude of the worker under present conditions. The fluctuations in wages are very much more personal to the worker in their appeal to his comforts and discomforts than the fluctuations of profit to the owners of industry and the executive.

One of the men in labor circles who has been a constant advocate of the retention of the present wage schedule by workers, mentioned a manufacturing concern the other day in connection with some disagreements. I said to this man, "How do you expect to get anywhere with your plans? That concern is almost down and out." He said, "Maybe it is, but I notice that the heads of the concern still own two or three automobiles and they still have their summer cottages and town houses, and they are still able to live in about the same comfort they did previously. They are still maintaining their executive organization in about the same way. The concern may be down and out, they are not. Why should the workers in the factory have to cut out some of the few comforts they have acquired and be the only ones to suffer in that way." To the worker this is a very strong argument. He lives from week to week, when his wages are good he secures a little extra comfort and he is not in the least likely to let that extra comfort slip without some struggle to retain it.

No man receives a cut in his earnings without raising some kick about it, and no man who studies the matter can expect his working forces to accept a

cut because business is bad, as long as there is the slightest chance to hold it.

No man who is in any position of responsibility in industry will accept a cut in his earnings without the idea that he will replace that cut as soon as business improves. The worker who is expecting a reduction in his pay to-day is expecting it on the basis that just as soon as business improves he will replace it if he can.

Any man who will study his own personal reactions will know that he cannot expect any other man to do what he finds it impossible to do, reduce earnings without complaint and without a distinct determination to get them back whenever it is possible. Any other contention or idea is absurd, and the idea expressed in this letter that manufacturers feel co-operation has received a body blow because of this reaction of the workers is equally absurd. This attitude as a matter of fact is in line with our general attitude on all matters which lie outside our personal relations.

We are very much more interested about the injustices of the other man toward us than we are about our own weakness in the same respect. It jars us pretty hard to be treated badly by some one else, while at the same time we are ready to excuse our own defects of the same kind. The worker is no different from anybody else, in that he desires to seize as much advantage as he can and retain it as long as he can. If he loses anything, he will try to get it back.

There is only one qualification to this statement and that is where he has become convinced of the squareness and understanding of the employer by long association, so that he is willing to play the game with him, believing that he will get back what is fair as business improves.

There are several isolated instances in industry where the workers have accepted a reduction and one or two where the workers have suggested a reduction. There are several instances where the workers have accepted a three-day week in order to keep all the workers employed to some extent. These instances occur because in those establishments the long association has been of such a character as to convince the workers they can ex-

pect a square deal and it is worth while for them to play the game all the way through.

The average worker does not believe that the manufacturer is suffering to any extent which need concern him. The newspapers he reads do not agree upon this, most of them discuss the reduction of wages as though it were the arbitrary decision of the manufacturer and had little or no relation to the cost.

Able men from union ranks and other interested organizations have written much which tends to prove in his mind that manufacturers have always received more profit than the worker and he is not inclined to waste any sympathy on the manufacturer over the troubles of the owners of industry. Neither is he in the least inclined to forego any advantage he has gained in wages unless he is obliged to, and then only under the impression that he will secure it again when business improves.

On the other hand, the manufacturer is frequently improperly informed as to the relation between the labor costs and the selling price in his own business, and is inclined to demand a reduction in wages because of the reduction in the selling price without any further analysis of the matter.

The manufacturer who desires to establish the same efficiency in his human relations which he expects in the development of his mechanical equipment, must be prepared to lead in fairness and square dealing just as he is prepared to lead in mechanical knowledge for the development of the other side.

Investment in time and experimentation to secure the right relations, can be no less than the investments in time and experiment demanded for mechanical improvement. He should know that this investment is much greater, and that a part of the study and development means the understanding of the worker better than the worker understands himself.

No man who understands the worker would expect him to accept a cut without kicking about it and without a desire to overcome it, and no man can expect the worker to believe, where he has no knowledge, or to drop his suspicions and play the game to his own disadvantage where he is ignorant of the effect which it will have.

Preparing for More Motor Vehicles in Tennessee

[From Department of Highways, Nashville, Tenn.]

THE Tennessee Highway Department is constructing highways both on the State aid and Federal aid plans. Aside from these highways, all the counties are constructing highways with funds derived from automobile license fees, county wheel taxes or county bond issues. It is impossible to secure any authoritative data on funds expended by the counties.

The following is a summary of State aid work under construction and in various stages of completion:

Type	Miles	Estimated Cost
Grading only	33.86	\$139,194.26
Macadam	16.00	29,401.08
Chert	8.4	80,531.25
Concrete	2.5	130,200.20
Bridges	34,539.23
Total	60.76	\$413,866.02

The 1921 Federal aid program consists of 271.75 miles of highways surfaced with the various types and having an estimated cost of \$8,575,900, and bridges estimated at a cost of \$370,000.

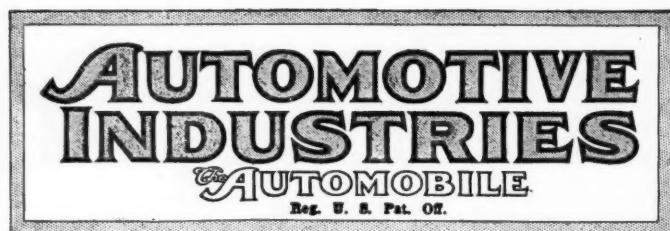
The following is a summary of Federal aid work under construction:

Type	Miles	Estimated Cost
Grading	20.47	\$73,837.10
Macadam	84.68	1,430,064.87
Chert	30.45	470,312.49
Bituminous macadam	160.43	2,852,366.47
Rock asphalt	46.57	1,465,639.19
Bituminous concrete	7.43	261,639.19
Concrete	26.52	1,006,308.60
Bridges	32,467.21
Total	376.55	\$7,753,541.27

Force account work on a day labor basis is being done on three macadam projects aggregating 16.77 miles.

One concrete highway project, 10.14 miles in length, is being constructed by county forces, under supervision of engineers of the State Highway Department, at fixed unit prices, making it essentially a contract job with the county as the contractor.

The remainder of the work is being done on a contract basis.



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Export Selling

NOW and then, it is possible to show graphically some of the merchandising efforts attempted in export selling. The following translated paragraph from a letter written by an automotive dealer in Mexico is one of such cases:

"I am well satisfied with the catalogues and the correspondence I have been getting and only deplore that practically everything is in English."

This dealer, who speaks no English and who lives in a smaller city where it is not so easy to obtain English translations as it might be in Mexico City, Vera Cruz or Tampico, had requested catalogues and service information from American automotive manufacturers, particularly on cars and tractors.

The result, as shown by the letter, is especially disheartening in view of the present efforts being made by American manufacturers to distribute their lines through that country. An opportunity has existed in Mexico during recent months for automotive expansion that should have called forth at least the best

efforts of every manufacturer who is sincerely desirous of building up and holding a large foreign business. But to realize on an opportunity such as this, should call forth the proper preparation by manufacturers and exporters.

Taxes! Taxes!!

SENATOR HARDING will be inaugurated President a week from Friday.

He is expected to call an extraordinary session of Congress to convene March 14.

Less than a month after the session convenes the House Ways and Means Committee will open its hearings on the question of Federal taxation.

Unless its present temper is radically changed, the congressional leaders will insist upon additional taxes on passenger-carrying automobiles on the ground that they are luxuries. The taxes proposed are unfair and almost confiscatory in their nature.

In addition to a prospective increase in Federal taxes it is almost certain many of the State Legislatures will enact laws which will impose additional tax burdens on an industry already overloaded.

The automotive industry is the second greatest in the United States. Its potential influence in Congress and in State Legislatures is tremendous. It should seek no favors, but it should object to being made the football of politics and taxation.

The only way heavily increased taxes can be averted is by concerted action on the part of the industry as a whole. If it makes the right kind of fight at least a part of these unfair taxes can be avoided.

Legislators, state and national, cannot be influenced unless a cannon, rather than a shot gun, is trained on them. They will take the easiest way, which is to tax automobiles—if the various branches of the industry begin shooting all over the lot instead of trying to hit the bull's eye.

With less than two months in which to map out a definite program and act, no steps have been taken to formulate a platform upon which every organization interested in automotive vehicles can stand.

Unless all organizations which are a part of the industry get together and act together, they will wake up some fine morning to find a few more taxes have been piled on their shoulders.

Legislation, state and national, never was more important to the industry than this year. The Motor Vehicle Conference Committee, through state committees, is watching state legislatures. The National Automobile Chamber of Commerce is on watch at Washington, but it is not exerting all its great influence to act in harmony with other organizations.

The directors of the Motor and Accessory Manufacturers' Association, at a meeting here Friday, decided to table the tax question because of the pressure of more important business. Their next meeting will be held late in March. Hearings on taxes will begin a fortnight after that date.

The industry is making no definite effort to prevent the flooding of the country with American made automotive equipment and supplies bought for a song in foreign countries.

The industry is making no definite effort to prevent the War Department from dumping scores of thousands of automotive vehicles of all kinds on the market.

If every member of every automotive organization was to send a telegram of protest to the legislators who represent him, legislators would at least know that the sender would hold him accountable for classing motor transportation as a luxury and taxing it accordingly.

Isn't it time for the automotive industry to prove it can work in harmony to prevent unfair, unjust and discriminatory legislative action?

If half the things planned are done to it, the recovery of the industry will be retarded for many months—perhaps years.

Parts Business in the Motorcycle Industry

ACCORDING to our British correspondent, British car manufacturers consider it rather beneath their dignity to use stock parts, and consequently there is no such thing as an assembled car manufacturer in Great Britain. In the British motorcycle industry, however, a large percentage of the manufacturers use stock parts or units such as engine or gearset, even some of the larger makers finding it economical to purchase these parts rather than manufacture their own. As a result many small makers who could not survive at all without the parts manufacturer are able to do a good business.

In this country quite the reverse condition obtains. A considerable proportion of our car builders do not fabricate any of the major units which make up the vehicle, but simply assemble the units which a specialty manufacturer, with large output, is able to sell them at a price which enables competition with even the large producer whose business is sufficiently large to enable him to build all or most of the component car units to advantage. The same is true in the truck and tractor fields, but strange to say is not true in the motorcycle industry. There seems to be no inherent reason why a motorcycle parts business could not be built up if proper initiative and thoroughgoing methods are applied. It is at least a possibility which is worthy of study by manufacturers who are seeking an opening in the automotive field.

Excess Profit or Surtaxes

A FINANCIAL man recently declared that it was not the repeal of the excess profits tax that was needed, but the repeal of the surtaxes on incomes.

He said that the great need of to-day is for more money with which to conduct business. This money in the past, said the financier, came from persons with large fortunes, who were constantly seeking new fields of profitable investment. Since the war closed, these persons have been engaged in transferring their investments to tax free securities. As rapidly as possible persons of large income had been selling the

ordinary sort of securities. It has been the job of salesmen of securities to find new capital to absorb these securities. This new capital has been found in the investor with a comparatively small income, but the new investor's power of absorption is not equal to carrying such a heavy load as is now offered to him. Already this investor has a large capital in Government bonds and is increasing daily his investment in industrial securities of the highest types, but the investor of large income is shedding too rapidly for him. So anxious is he to avoid the surtax that industry is handicapped in its effort to secure capital.

It is surprising how many of the common people one finds who believe that a limit on company profits is a pretty good thing. The average person probably has an exaggerated idea of how much profit companies make, and they are not much educated by the annual statements of these companies. Usually these tell nothing to the public. When the casual reader sees in these reports a careful restraint in the way of saying anything about excess profit taxes, he suspects that the taxes were so large as to need concealment.

Anyway, the excess profit taxes probably will not be much of a bother for a few months, so why not get rid of the surtaxes?

Using Higher Compressions

THOSE interested in bettering the thermal efficiency of automotive engines should study the article by Mr. Ricardo in this issue.

For several years past there has been a tendency toward lower compression ratios which some think were forced upon us by the inclusion of less and less volatile elements in the average fuel available. This is, of course, a tendency toward lower efficiency, hence it is refreshing to hear a word now and then about the use of higher compression and higher expansion ratios—even higher than were used when fuel that didn't produce a knock was available in abundance.

Perhaps the easiest way to adapt the engine to the fuel was to lower the compression, but it is evident that it was not the only way and certainly a very poor way from the standpoint of economy. Diluents which prevent excessive pressures and temperatures have been tried with varying degrees of success, depending upon their nature and proportion. Some say that diluents, such as benzol, which in themselves possess fuel value will never see very extensive use because they are not available in sufficient quantity. Inert gas such as exhaust products can be used to advantage in some cases as Mr. Ricardo shows. But perhaps the most promising diluent, at least within certain limits, is pure air, especially when used under part load conditions in such a way as to maintain high compression and thus avoid throttling. To do this requires some but not extensive alterations in the conventional type of automotive engine (as we propose to show in articles soon to appear in AUTOMOTIVE INDUSTRIES). The problems involved are not completely solved, but do not seem by any means insuperable, and the advantages are of such great significance as to make the effort at solution well worth while.

Army Starts Sale of Surplus Cars

Unserviceable Stock First to Be Cleared

Twenty-nine Thousand Vehicles Booked for Auction—Deny Undisclosed Supplies

WASHINGTON, Feb. 18—Orders have been issued to all departments of the United States Army to dispose of surplus automotive equipment which it is officially estimated will amount to approximately 29,000 unserviceable vehicles. The sales campaign which was inaugurated at Camp Holabird, Baltimore, this week, will be nation-wide though the vehicles will be concentrated at four camps now under the supervision of the Motor Transport Corps of the Army. Unofficial though apparently authentic information to the effect that general orders calling for the disposal of all vehicular equipment, retaining only 30,000 vehicles in this country, insular possessions and in Europe, was denied at the War Department today.

This unheralded movement on the part of the Army has resulted in protests to Congress and the Secretary of War from automobile dealers associations and chambers of commerce. The War Department has taken little cognizance of the protests from business men and, it is said, will continue its program of selling 29,000 automobiles, trucks, motorcycles, tractors and bicycles.

Practically all this material is now unserviceable, the War Department advised AUTOMOTIVE INDUSTRIES to-day, and because of the large sums required to put the stock in service, they point out that it will have little effect on regular dealers and will boom business for garages and dealers selling accessories. Dealers, however, contend that the net result of this flood of vehicles will be disastrous because prospects for new machines will take advantage of ridiculously low prices accepted by the Army and take a chance on a small repair bill.

Censor Inquiry Results

AUTOMOTIVE INDUSTRIES was informed to-day that the inquiry undertaken by the Inspector-General under orders from the Secretary of War brought out some startling facts. It is claimed that two unlisted warehouses were discovered near Newport News which contained several hundred uncrated automobiles, trucks and ambulance bodies, which had been stored with a view to easy loading when needed in France. These machines are deteriorating rapidly owing to climatic changes but it is averred that the majority of this lot is ready for service after slight repairs. Officials of the

Motor Transport Corps refused to confirm this statement.

Recent attacks in Congress directed at the War Department for the misuse of automobiles purchased for war purposes has resulted in establishment of a censorship. This information was obtained from authoritative sources, however. The Inspector General's survey was caused by the introduction of numerous bills in the Senate and House directing the War Department to turn over all surplus automotive equipment to the highway departments.

The story is current and officially confirmed that special orders were issued recently to departmental commanders to prepare charts based on the reduction in the size of the Army as authorized by recent legislation. These charts were to cover the amount of automotive equipment and other vehicles considered absolutely essential to the maintenance and transportation of the troops in each Army post throughout the world. Army officials deny, however, reports that the analysis of the charts received here indicated that there would be from 200,000 to 300,000 vehicles of all types, motor and horse-drawn, which would be offered for sale as surplus.

The Transportation Division of the Army informed AUTOMOTIVE INDUSTRIES that approximately 103,000 automotive vehicles were in France during the years of the war and about the same number bought and in service in this country. They pointed out that thousands of vehicles were rendered useless in service and a large part of the remainder sold abroad rather than disrupt American markets.

Under existing legislation, the War Department has been disposing of automobiles, trucks and tractors by transfer to the Postoffice Department, the Bureau of Public Roads and the Public Health Service.

Army Reduction Makes Surplus

Tentative measures pending in Congress would require the sale of 10,000 trucks, 1000 automobiles, and 2000 tractors. The reduction in the Army brought about a natural surplus without the stimulation of legislation. The War Department claims that all Government agencies have first choice of surplus automotive equipment before it is offered for sale at auction. The Bureau of Public Roads asserts that the War Department has frequently declined to transfer equipment needed for highway construction on the ground that no surplus was available.

Congressman Anthony of Kansas had ideas of his own and declared that the highways could not absorb additional equipment and imposed a provision in the Army appropriation bill to compel the sale of not less than 10,000 trucks

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Baltimore Buyers Pay \$40 to \$2,400

2100 Light Delivery Cars, Trucks and Ambulances Sold in First Allotment

BALTIMORE, Feb. 21—Despite a protest by the Baltimore Automobile Trade Association to the Government asking that the sale of used motor vehicles in large quantities be discontinued in Baltimore, officials of the Government sold last week 2100 motor cars of all kinds and in various conditions.

No touring cars were offered, the models being light delivery cars, trucks and ambulances. A crowd that ran into thousands was on hand throughout the sale and the machines were sold at a very rapid rate. For a time the average was about two a minute.

Inspection of the cars by buyers was limited to a look under the hood and a moving of brakes and gears and any other exterior inspection possible, but no cars were permitted to be tested as far as operation was concerned.

Government officials stated the cars were serviceable, but did not come up to the specifications demanded by the Government. All the machines that left Camp Holabird, the Government camp a few miles from the city, were towed away.

The cars being sold here are used motor vehicles gathered from the various motor camps of the United States. They are being sold under the authority of the Quartermaster-General's office and officials of the Motor Transport Corps directed the sale. Buyers came from all over the country. It is estimated that the first day's sales totaled \$200,000.

On the second day some of the big trucks brought as high as \$2,400. The lowest price was \$40.

Purchases Range to \$20,000

Interests said to represent the General Motors Corp. and the Backus Motor Co. of East Orange, N. J., are reported to have purchased about \$20,000 worth of cars each.

Brigadier-General A. E. Williams, assistant to the Quartermaster-General, attended the sale and was accompanied by Colonel F. H. Pope, chief of the Motor Transport Corps, and Lieutenant-Colonel W. N. Haskell, assistant director of sales.

Practically none of the cars leave the grounds under their own power. About 300 freight cars of the B. & O. and Pennsylvania Railroad now are parked just outside the grounds ready to receive the cars for out-of-town shipment.

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Production Grows as Sales Expand

Paige Sets Schedule of 1,500 for March

Reports Orders for 800 Cars on Books—Packard Sales Show Increase

DETROIT, Feb. 18—Optimism engendered by enthusiasm at the national shows and which was discounted to some extent by more conservative manufacturers, who attributed it solely to stimulation of the exhibitions, has cropped out anew this week as the result of actual sales recorded and orders to parts manufacturers. A sharp upward trend is noticeable.

While the improvement, in the minds of many, is attributable in great measure to weather conditions, which naturally have a tendency to hurry the spring demand, others insist that it presages a return to real business and predict a steady improvement that by mid-summer will find the industry in pre-war normal condition. Outstanding evidence is the attitude of the Paige-Detroit Motor Car Co., which now is on a schedule of 40 cars a day, operating four days a week with the plant's entire force of approximately 3000 men. According to Paige officials there are 800 actual orders on the books, and a production schedule of 1500 cars for March has been outlined.

Paige dealers throughout the country, according to factory officials, report an inclination on the part of the public everywhere to assume a buying attitude, and while actual orders have shown no great spurt, there is every indication, dealers say, that brisk spring business will begin during March and increase steadily.

Packard Ready to Expand

The same optimistic report was given out by officials of the Packard Motor Car Co. In fact, it was said at the Packard plant that the average for the present week was far in excess of that for the same week last year in point of actual orders. The Packard plant is operating with only about 1000 employees and building approximately 25 per cent of the normal schedule. Packard officials say if sales continue to increase in the next few weeks as they have in the last two, the factory force and output will have to be materially increased.

Fred Glover, general manager of the Timken Roller Bearing Co., expressed himself gratified with the signs of improvement. His company, Glover said, had received orders in much better volume for February, while the great improvement in orders for March clearly indicated that the return to normal would soon be under way vigorously.

GOODYEAR SCHEDULE INCREASED TO 60,000

AKRON, Feb. 22—The Goodyear Tire & Rubber Co. to-day went on a production basis of 60,000 tires weekly increasing from 38,000 and increasing the operating time from four eight hour days each week to five eight hour days a week, with no additional men being put on. This is the first substantial increase in production announced by any Akron rubber company and is the first increase by Goodyear since the beginning of refinancing negotiations. The company at its peak last summer, was making 33,000 tires daily in the Akron plant. Goodyear's announcement, coupled with a shipment of 30,000 tires to Henry Ford by the Goodrich company indicates a steady upward trend in the tire industry.

Continental Motors

Adds 1,000 to Force

NEW YORK, Feb. 21—Business of the Continental Motors Corp. is increasing, according to an optimistic statement on the business outlook made by G. W. Yeoman, vice-president and treasurer of the company, in response to a request for information made by Sidney S. Meyers, general counsel of the Motor and Accessory Manufacturers' Association. After pointing out the impetus given by the New York and Chicago shows, Yeoman said that nearly 1000 men have been added to the force employed in the Detroit plant to get out this month's demands and that orders for delivery for March will be from 30 to 40 per cent greater than February.

"If anyone tells you this is only a little spurt and that the demand will decrease, tell them they are crazy," said Yeoman. "Sixty to 90 days from now the automobile business, through the possibilities of liquidating large stocks of inventory, should be in a very advantageous position to again establish itself on a cash basis. The sale of trucks has not yet started in any volume, although we have orders on hand from about 60 per cent of our customers for shipment the latter part of February and for the months of March and April.

Necessary as Foodstuffs

"Our entire organization is of the firm belief that the automobile and truck industry is built on a strong foundation and that its products are as necessary to the upbuilding of this country as the raising of foodstuffs and other so-called staple articles."

Kalamazoo Plants Increase Operations

Definite Increase in Business Experienced Since Shows—See Complete Recovery

KALAMAZOO, MICH., Feb. 21—"Just as it has in times past, the automobile industry will lead business in this country back to prosperity" said Christian Girl, president of the C. G. Spring Company, during a discussion of the outlook for business in the near future.

"Distribution is still the weakest link in the chain of American industry" added Girl. "It is the close affiliation of the automobile with the problems of distribution and the need of motor cars and trucks to solve these problems that will tend to a steady revival of the automobile business. This revival will not be an over-night affair like the recent suspension. It will come gradually.

"We have suffered from a hard fever. While we no longer have the fever, we are weaker than when the fever raged. It will take time to convalesce, but recovery is certain. I look for over 50 per cent production this year and normal business in 1922."

The C. G. Spring Co. is already feeling the effects of the coming better times. Inquiries are common and many substantial orders are being booked. The working force will be increased steadily as business requires. This also applies to other Kalamazoo manufacturers allied with the automobile industry. The recent depression is gradually disappearing and is being succeeded by a feeling of optimism.

"We are now running about 60 per cent of our capacity" said J. D. Bobb, president of the Limousine Body Co. "I look for a substantial increase in business by spring.

Substantial Orders Received

"The outlook is flattering" said F. P. D'Arcy, president of the D'Arcy Spring Co. "During the past few days we have received several substantial orders and the inquiries at hand indicate there will be plenty to do later on. Our plant is now operating on about 33 per cent capacity, but the number of employees will be steadily increased. The fact that we intend to reorganize and recapitalize indicates that we are looking for a larger business in the future than in the past."

James I. Handley, president and general manager of the Handley-Knight Co., reports orders on the companies books for over \$250,000, all to be filled by April.

"Conditions have improved greatly
(Continued on page 482)

St. Louis Estimates 750 Sales at Show

**Total Business Done Is Expected
to Exceed \$1,000,000—At-
tendance Mark Highest**

ST. LOUIS, Feb. 18—From the viewpoints of attendance, merchandising, sales and the procuring of prospect lists, the fourteenth annual automobile and accessory show, held in this city last week, was without question the most successful of all St. Louis exhibitions, according to Robert E. Lee, president of the St. Louis Automobile Manufacturers and Dealers Association, and manager of the show.

Every exhibitor reported sales daily, almost from the time the doors were opened. An incomplete analysis of the business consummated during the week make a total of approximately 750 cars sold. Considering \$1,500 as an average price, the total will surpass the million dollar mark. This represents an increase of a minimum of 10 per cent over the sales negotiated during the 1920 exhibition, according to Lee.

The total attendance, including the record breaking crowd of 22,000 on the opening night, amount to a 20 per cent increase over last year's show and reached 105,000. This is the greatest number of persons ever attending a St. Louis automobile display. "An outstanding feature of the show is the fact that exhibitors obtained prospect lists much larger than those recorded during previous shows," said Lee. "This proves that the public is again in the buying mood and the fear of continued business depression is allayed."

Because of the unusual interest which the public showed during the exhibits last week, the dealers are predicting that during the spring months there will be a shortage of cars. On Feb. 1 the St. Louis association in making its monthly canvass of the number of unsold motor cars in the city, found that the stock was far below that which the dealers usually carry at this time of the year.

Stock Accounting Asked in New Templar Suit

COLUMBUS, Feb. 19—N. P. Clyburn, former prosecutor of Ross County, now a resident of Washington, has brought suit in the Franklin County Courts asking for a receiver for the Templar Motors Co. of Cleveland. Included in the action is a complaint against M. F. Bramely, president of the Templar Co., and W. O. Cooper, head of the W. O. Cooper Co., the stock selling agents, for an accounting on the allegation that the two named persons received \$2,500,000 or thereabouts for the sale of stock illegally. Former Attorney General F. S. Monnett of Columbus is plaintiffs' attorney.

B. Pittman, formerly sales manager, who is now in the brokerage business in

Columbus, brought a similar suit against the corporation and officers, but it was dismissed. Several indictments have been returned against Pittman, one of which is for the embezzlement of \$200 and another for circulating a circular tending to reduce the value of stock. This is the result of a circular issued telling of the alleged illegal financial transactions of the company. The annual stockholders' meeting of the Templar Co. is scheduled for March 1.

Sales Sentiment Grows Throughout Country

WASHINGTON, Feb. 21—Business conditions will improve from now on, says Archer Wall Douglas, chairman of the Committee of Statistics and Standards of the Chamber of Commerce of the United States, in his monthly review of business issued to-day.

"The most convincing evidence that we are on the high road to recovery," Mr. Douglas said, "is found in the universal report, brought by traveling salesmen from every section of the country, of steadily growing sentiment that business will be better in the spring—not a sudden return to prosperity, which is neither likely nor desirable, but a slow and natural working out of those processes of liquidation which are now in full operation."

Gasoline Prices Drop Six Cents in Mid-West

NEW YORK, Feb. 21—Gasoline prices have been reduced from 1 to 6 cents a gallon in the principal cities east of the Rocky Mountains, but no reductions have been made as yet on the Pacific Coast. Reductions of 3 cents have been made throughout the eastern territory and of 4 cents in the middle west. In the mid-continent and southwest territory prices have declined in some cities as much as 6 cents a gallon from the peak of 1920. The lowest price is in Kansas City where it is 21 cents a gallon, with St. Louis second at 22.5 cents. Chicago and Houston, Tex., are tied for third place at 23 cents. The price is highest at Butte, Mont., where it is 31 cents.

DISCUSS TRUCK PARTS SERVICE

CHICAGO, Feb. 24—A committee of the Motor Truck Manufacturers Association consisting of O. Armleder of the O. Armleder Co., M. Cook of the Service Motor Truck Co., and J. W. Stevenson of the Indiana Truck Corp., will meet with representatives of units and parts makers at the Hotel La Salle here to-day to discuss with them the subject of establishing their own distributing and service stations. This meeting was scheduled for Detroit on Feb. 18 but was postponed.

COLUMBIANA RECEIVER ASKED

EAST LIVERPOOL, OHIO, Feb. 21—A petition has been filed at Lisbon asking for the appointment of a receiver for the Columbiana Rubber & Tire Co.

Medium Priced Cars Lead New York Sales

**General Improvement Noted in
All Classes—Dumping Slows
Truck Sales**

NEW YORK, Feb. 21—More motor cars were sold in New York during the past week than in any similar period in several months. The upward trend of the market is not confined to any particular car, or class of cars. The return to buying has been general and for the first time in many weeks there is a distinct demand for cars that is evidencing itself in many ways.

The largest sales increase was made in the medium price class. Three dealers in this class reported sales for the first 18 days of February to be 33½ per cent above the same period in 1920. While several of the others did not approach this mark, all had experienced increased business.

There also was an appreciable increase in the demand for the higher priced cars. Most of the "quality class" dealers reported business increases that were distinctly satisfactory.

In this class, as well as in the medium priced car class, there was a marked increase in the demand for open cars. Early spring delivery orders in open models in the higher priced cars were particularly noticeable.

While there is no marked improvement in the truck market, there is evidence of an early upward trend of the extremely low sales record. The truck dealers are watching closely the effects of the sale here of some of the A. E. F. equipment in the past few days. It is felt that the natural spring demand for trucks may be somewhat diluted this year if these trucks are dumped on the market.

There has been little appreciable demand for used cars, although the market is slightly better. Some of the dealers have had inquiries for used cars for export to Belgium and a few lower European countries.

AUTOCAR ADDS TWO DIRECTORS

PHILADELPHIA, Feb. 21—The board of directors of the Autocar Co., Ardmore, Pa., has been increased from seven to nine by the addition to the board of J. Howard Reber and Roscoe T. Anthony. The other directors were re-elected and they in turn re-elected the old officers. David S. Ludlum is president of the company.

EVERED SOLD TO TWIN PORTS

SUPERIOR, WIS., Feb. 21—The Twin Ports Steel & Tractor Co., which was incorporated recently with \$250,000 capital, has taken over the entire business and works of the Evered Foundry & Machine Works here. It will continue the manufacture of gas tractors, hoisting engines and power winches, but will also take on jobbing orders for pattern, casting and machine work.

Trucks Find Place At Machinery Shows

Manufacturers Encouraged by Roads Exhibit Results, to Take Mine Show Space

CHICAGO, Feb. 19—Although manufacturers have not been disposed to stage a separate truck show in this city, they are at the same time taking advantage of every opportunity to put their product before the public through the medium of other shows into which a display of motor trucks fits well. This was shown in their use of the Good Roads Show.

A still truck show, it has been felt, lacks the magnetic power that a show in motion has, and the manufacturers saw in working machinery, such as that used in road building, this desired touch. Thousands of road builders attended the good roads show and while their interest did not center in the trucks when they came, nevertheless they could not help but see them once they were there.

Now comes another show, the mining machinery show, which is to be held in Chicago some time in the fall and possibly on the Government pier. Manufacturers appealed to the good roads builders with their exhibits of last week; in the fall they will send forth their message to the mine operator and show him, just as they showed the road builder, how essential the motor truck is in his line of business. The approaching mining show will be a show in motion, just as the good roads exhibit was, and the truck manufacturer will make capital of it.

Wisconsin Factories Resume on Large Scale

MILWAUKEE, Feb. 21—Passenger car manufacturers in Milwaukee and Wisconsin are steadily increasing working forces in order to handle current orders for immediate and near-future delivery. In Milwaukee, the four-cylinder division of Nash Motors Co., Kenosha, which was down for several weeks, is employing more than 400 men. The Milwaukee assembling plant of Ford has resumed work and is rapidly reaching its normal schedule of 115 cars a day. Manufacturers of automotive materials, parts and equipment likewise find conditions more encouraging and are making gradual increase in working forces and output. A considerable number of men have been notified to report for work March 1 and 15, and in the meantime a few men are being taken back every day.

SIEMON SELECTS ROCHESTER

ROCHESTER, Feb. 21—Assurances that the Siemon Tractor Corp. will establish its plant in Rochester have been given to the industrial development committee of the Chamber of Commerce here. Negotiations have been in progress for the past few weeks between the

chamber and the officers of the company which has been in existence for three years. An extensive investigation of the tractor, the cost of manufacture, the probable market for it and the financial situation in which the company finds itself, all has been investigated.

J. C. Siemon, president of the corporation, is a business man well-known in Canada and Buffalo. A number of prominent Rochesterians have interested themselves financially in this company. President Siemon announces, however, that additional capital will be needed to establish the plant in Rochester. He is looking for quarters for a site at the present time.

Briscoe Schedules 12,000 for 1921 Production

DETROIT, Feb. 18—Waring Sherwood, advertising manager of Briscoe Motors at Jackson, in reply to rumors that the plant was about to shut down, has authorized the statement that Briscoe is rapidly getting to normal production, and expects to reach that point by April 1.

"Our plant has not been shut down at all," said Sherwood. "We have never at any time had less than 500 men working, and we have put on 40 additional men. We are building from 15 to 20 cars a day, and plan to increase our force and output steadily until by April 1 we expect to be turning out 50 cars a day. We have outlined a schedule of 12,000 Briscoes for 1921, and have every reason to believe we will carry out that schedule.

"There is every indication of good spring and summer business, and our actual sales before, during and since the National shows, convince us that the automobile business rapidly is on the upgrade. Everything points to splendid business throughout the year."

TOOL APPLIANCE ORDERS GROW

PHILADELPHIA, Feb. 18—A marked increase in orders is recorded for the first half of February by the Standard Shop Equipment Co., manufacturers of set-up appliances for machine tools. This company does considerable business with automobile manufacturers, so that the increase furnishes another indication that business has started on the upgrade. There is no reason to believe this increase has been temporary.

AUTO-LITE ADDS 200 MEN

TOLEDO, Feb. 21—The Electric Auto-Lite Corp., a subsidiary of the Willys Corp., has called back to work nearly 200 former employees, making about 400 now employed out of a normal 3000. While the outlook for the future business remains uncertain, it is more encouraging than it has been.

BROCKWAY STARTS FULL FORCE

CORTLAND, N. Y., Feb. 21—The Brockway Motor Truck Co. has resumed operations with its full force of 200 employees. Preparations are being made for the enlargement of the plant.

Willys-Overland Bankers Organize

Protective Committee Formed Because of Close Association With Willys Corporation

NEW YORK, Feb. 23—Bank creditors of the Willys-Overland Co., Inc., have formed a committee headed by Ralph Van Vechten of the Continental and Commercial Bank of Chicago to protect their interests. The committee includes John Sherwin of Cleveland, Joseph Wayne, Jr., of Philadelphia, and several representatives of New York banks and banking houses.

The committee was formed because of the close relations existing between the Willys-Overland Co. and the Willys Corp. The affairs of the Willys Corp. have been taken over by a bankers' committee which is working in harmony with another committee representing merchandise and construction creditors.

The banks interested in the Willys-Overland Co. are by no means identical with those which have made heavy loans to the Willys Corp., and the Chase National of New York, which is probably the largest bank creditor of the corporation, is not represented on the other committee. It is understood, however, that the two committees do not conflict in any sense and that they will co-operate so far as possible for the good of the two companies.

The affairs of Willys-Overland are not involved directly with those of the Willys Corp., although 27 per cent of its common stock is owned by the corporation. It is understood that no re-financing is contemplated for Willys-Overland in the immediate future nor has any merchandise creditors' committee been formed up to this time.

Large blocks of the first and second preferred stock of the Willys Corp. have been deposited with protective committees which have been formed, and preliminary conferences already have been held with the bankers' committee.

KELSEY WHEEL PLANT STARTS

MEMPHIS, TENN., Feb. 21—Following an inactive period, the Kelsey Wheel Co., large manufacturers of wheels and automobile bodies, began a general resumption this week with 100 employees at work. Ten per cent capacity runs were started and from week to week a return to normal standards will be accomplished. The company employs about 800 men under normal conditions.

ALLEN RESUMES ON NEW ORDERS

COLUMBUS, Feb. 21—The receivers for the Allen Motor Co. have opened the Columbus factory, which was closed down recently for inventory, with about 100 men employed. Orders for a large shipment of cars were received recently and mail orders are coming in. The plant is being operated on about a 50 per cent basis.

Tariff Rule Hurts Cars at Paris Show

American Place Selection Follows
British, Italian and Belgian
—German Cars Barred

PARIS, Feb. 1.—Regulations for the Paris automobile show, to be held in the Grand Palais from Oct. 5 to 16 next, provide for twelve classes covering the entire automotive industry, with the exception of aviation. On the main floor, which will be reserved to automobile exhibits, stands of 40, 60 and 80 square metres will be provided, with prices varying from 120 to 500 francs per metre, according to position. The rental of the best and biggest stands will, therefore, be 40,000 francs, and the smallest stand on the ground floor will cost 4800 francs. The above prices comprise electric lighting and all decoration.

Manufacturers belonging to Allied nations are admitted on the same terms as French firms, providing they have taken part in three previous Paris shows and on condition that their pre-war import duties were not higher than 15 per cent ad valorem. Under this rule American firms do not have the same choice as British, Belgian and Italian manufacturers. Special positions will be reserved for American firms, and for manufacturers belonging to nations who were neutral during the war. Late enemy nations will not be admitted.

The Paris show is handled by a committee composed of delegates from the leading French automobile trade associations, with Henry Cézanne as general manager. The balance remaining after all expenses have been paid will be disposed of as follows: Thirty per cent to be given to organizations existing for the benefit of the French automobile industry, and 70 per cent to be returned to exhibitors in proportion to the rental they have paid for their stands. Price of admission to the show will be 10 francs on the opening day and on Fridays, and 3 francs on all other days.

Requests for space should be sent to the offices of the organizing committee, 51 Rue Pergolese, Paris, not later than June 1, 1921. The drawing of lots for positions will take place from Aug. 1, but applications received after June 1 will only be considered after other requirements have been met. Exhibitors in the Paris show must undertake not to take part in any exhibition, race, or competition not approved by the National Automobile Federation.

Swiss Railroads Seek Truck Line Regulation

NEW YORK, Feb. 21.—Dispatches from Switzerland say that the use of motor trucks for transporting goods in that country has become so extensive that the Swiss state railways have requested the government to take legal measures to prevent private firms from

competing with them. Not only has passenger traffic on state railways been cut down by the use of private motor cars, but freight traffic has also been seriously affected by motor vans. Every time freight rates are raised more persons avoid use of the railways and the truck service has become a formidable rival for the transportation of goods, especially as they can provide door to door delivery.

One motor truck company proposes to establish a service between Italian and French ports and Switzerland, thus taking goods coming from the United States direct to Swiss warehouses on motor vans.

Receiver Is Appointed for American-British

NEW YORK, Feb. 21.—George C. Van-Tuyl, Jr., has been appointed by Federal Judge Knox as receiver for the American & British Mfg. Corp., New York, in a suit brought by the American & British Securities Co., a creditor, for \$37,516. The petitioning creditor is a Delaware corporation. Its claims are for money loaned, but it also holds 23,265 shares of the preferred stock of the manufacturing corporation and 31,277 shares of the common. The bond of the receiver has been fixed at \$20,000.

The petition alleges that the defendant company is financially embarrassed, although it is considered solvent. It is stated that in the summer of 1919 the American & British Mfg. Co. entered into a contract to construct automobiles on a quantity basis and that in order to complete the contract it had to sublet certain parts of it. After making its agreements, a strike broke out in the plant of one of the sub-contractors, and because of this labor trouble, the business of the manufacturing company was put back for nearly a year, but it continued to manufacture other parts, and in so doing used up all its funds, which amounted to more than \$1,000,000. This is stated to be the cause of the present trouble. Plants of the company are at Bridgeport, Conn., and Providence.

COMMITTEE TO DIRECT PREMIER

INDIANAPOLIS, Feb. 21.—The board of directors of the Premier Motor Corp. has appointed a special committee to direct the affairs of the company because of the death of Dr. L. S. Skelton, president. This committee is headed by I. F. Schaefer and includes Newton P. Hutchinson, A. Follansbee, J. D. Sutherland, the Fletcher American National Bank and the George W. Goethals Co. The Goethals company has been retained to make a complete study of the Premier situation.

MERCEDES SOON TO ARRIVE

CHICAGO, Feb. 18.—The new 6-cylinder Mercedes car is expected to arrive in this country in the next thirty days. It will sell for \$10,500, chassis complete, and will be handled in the Chicago territory by the Mercedes Agency, 30 North Michigan Boulevard.

British May Change Yearly Show Plan

Annual Olympic Exhibit Loses
Favor With Manufacturers—
Not Justified by Trade

LONDON, Jan. 27.—(Special Correspondence)—The statement which has been rife to the effect that the next Olympia car show is to be held in September, is at best premature, and most probably quite impossible of being realized. It would be nearer to the truth to state that a movement finds increasing favor in the trade to forego the yearly show, but it is not so certain whether the view inclines to a more or less total abandoning of the show or to holding it in alternate years, as in Paris.

Considering that cars are becoming stereotyped in design, that standardization bids fair to reduce varieties of types and makes, and, above all, that the show is a tax on the industry, it is not surprising that the matter of abandoning an annual show is becoming prominent in the trade.

Last year's show is reported to have yielded a normal year's profit despite much higher administrative and other costs. Nevertheless it was not justified by the trade it brought, so that on this account and others, it is not surprising that the movement against, at least a yearly show, is gaining support.

Dealers as a body, especially the leading ones, are averse from a yearly show. They say that they can do all their business locally, and that the show period tends to disturb normal business. Manufacturers who dissent from the yearly show ideal say that its purpose so far as it is a means of financing the trade society can be accomplished by a levy on members, varying with their turnover and output or some other reasonable means of assessment.

DUDLO EXTENDS PLANT SITE

FORT WAYNE, IND., Feb. 19.—The Dudlo Co., which in normal times employs about 1000 men, has announced the purchase of six acres of ground adjoining its present plant upon which additional buildings will soon be erected. The company makes insulated wire for automobiles and other automotive products. Its principal customer is the Ford company. At the present time the plant's departments which work on Ford material are shut down.

DUPLEX OFFICERS ELECTED

BEAVER DAM, WIS., Feb. 21.—At the annual meeting of the Duplex Storage Battery Co. of Beaver Dam, Wis., a \$1,000,000 corporation manufacturing storage batteries, the following officers were elected: President, John W. Deniger; vice-president, John V. Zweck; secretary and general manager, Peter M. Kettenhofen; treasurer, M. A. Jacobs. The directorate was increased to two members.

S. T. D. Enter 3 Cars For Indianapolis

Sunbeams and Talbot-Darracq to
Be Driven by Boillot, Resta
and Thomas

PARIS, Feb. 5—(Special Correspondence)—The European representative of the Indianapolis Motor Speedway Co. has received the official entries of one Talbot-Darracq and two Sunbeam cars for the next 500-mile race on the Hoosier track. André Boillot has been selected to drive the Talbot-Darracq, and Dario Resta and René Thomas will be at the wheel of the two Sunbeams. All three men have had previous experience at Indianapolis; Thomas and Resta each having finished first and second in previous races. Until this year André Boillot was a member of the Peugeot team.

The Talbot-Darracq and the Sunbeam cars form part of the Franco-British syndicate known as the S. T. D., comprising Sunbeam, Talbot and Darracq. There is one experimental department, under the control of Louis Coatalen, for the three firms, and the racing cars are consequently all of one design. The Sunbeams, however, have been built at Wolverhampton, England, while the Talbot-Darracq are being produced at the Darracq factory, near Paris. For the first time eight cylinder ahead engines are

being built, the bore and stroke being 65 by 112 mm., which brings the piston displacement just inside the 3-litre limit.

Louis Coatalen, who will accompany his team, states that the cars will be rushed back to France immediately after the Indianapolis race in order to take part in the French Grand Prix at Le Mans, on July 24. In the French classic the S. T. D. combination will have seven mounts, as follows: two Sunbeams, drivers André Boillet and René Thomas; three Talbot Darracq, drivers Zobrowski, Seagreave and H. J. Cooper, and two Talbots to be handled by K. Lee Guinness and D. Resta.

Moto-Meter Establishes European Production

NEW YORK, Feb. 21—Arrangements for the establishing of branch factories of the Moto-Meter Co., Inc., of Long Island City, in England and France, have been made by President George H. Townsend and E. V. Hennecke, the sales manager, who recently returned from abroad. The Benjamin Electric Co., Ltd., of Tottenham, London, will have charge of the manufacture in England, and the French factory will be conducted at 50 Avenue de la Grand Armee, Paris, by F. Represseau et Cie. Both factories already are in operation.

A Canadian factory will be operated at Hamilton, Ont., under the direction and supervision of the home office. S. E. Ryder will be in active charge.

France Makes Changes in Regulations Governing Fuel Consumption Tests to Be Held at Le Mans

PARIS, Feb. 5 (Special Correspondence)—There will be a repetition of the French fuel consumption tests of last fall on May 14 and 15 next, when more scientific measures will be adopted than were possible for the initial test. The event will be held on the closed course at Le Mans, selected for the French Grand Prix race. It is 10½ miles round, and practically level. A distance of about 150 miles will have to be covered, but by reason of the shortness of the course it will be possible to maintain accurate control over the competitors.

This year's event will be open to stock cars only, cyclecars and motorcycles being excluded. Fuel will be given out to the competitors the day before the competition, and the cars will all be kept in a closed park until the time for starting. They will then be pushed to the starting line, and as the amount of fuel is calculated according to piston

displacement and weight, the winner will be the one covering the greatest distance.

Among the changes are a minimum speed for each individual lap, and a speed competition on the day following the fuel trials, without any change being made on the carburetor adjustment. Last year all the competitors adjusted their carburetors for speed after the fuel trials. Any kind of fuel can be used.

Six classes are provided for, beginning with machines of 61 maximum cu. in. piston displacement and increasing to a class of more than 275 cu. in. The following table shows the minimum weight for each class, the minimum speed to be maintained, and the allowance of fuel, in American gallons, per 62 miles. Corrections will be made on this amount according to increases in weight and in piston displacement.

Class	Piston displacement cubic inches	Minimum weight pounds	Minimum speed miles per hour	Fuel allowance, Gallons, per 62 miles
1	61	1212	15.5	1.32
2	85	1873	19.8	1.58
3	122	2535	22.3	1.90
4	183	3086	24.8	2.19
5	275	3527	28	2.51
6	Above 275	3857	31	2.91

Money Need Hurts British Industry

Austin Would Defeat American
Competition With Increased Cap-
ital—Trade Has Bad Name

LONDON, Jan. 27 (Special Correspondence)—Sir Herbert Austin, M.P., head of the Austin Motor Co., at a meeting this week of Austin stockholders held that the British industry is undercapitalized for current and future needs. He said if it had \$125,000,000 it could build cars just as cheaply as Ford, and that competition in the future with British cars would be less from America and more with European countries.

He admitted that the motor trade had "a bad name" among city interests, but could see no justification for the fact. He referred also to what he considered the unfair competition the British makers have to face in foreign countries and in British colonies, and stated that there were thousands of foreign cars at foreign and colonial ports awaiting disposal by auction. Despite all these difficulties, he stated that some British firms were selling treble more cars than at the corresponding period before the war.

The position, said Austin, is that the industry wants more capital; the city investors think that it has had more than enough. It is for the public to decide. In other words, it is a matter of restoring public confidence in the industry's prospects which, unfortunately, have been badly shaken by the failure of the trade to justify the post-war hope for its recovery.

PATENT OFFICE BILL FAVORED

WASHINGTON, Feb. 18—The House this week accepted the conference report on the Nolan bill providing for increases in the force and salaries in the Patent Office and for other purposes. The section imposed by the Senate vesting authority with the Federal Trade Commission to accept assignment of patents made by government employees except employees of the Patent Office, was accepted by the conferees and the house. The commission will have power to administer government patents and the right to say who shall have commercial rights, where the inventor surrenders his patent and rights thereto to the government.

AUTHORIZE AIRCRAFT PAYMENTS

WASHINGTON, Feb. 19—Manufacturers of aircraft now engaged in fulfilling Government contracts entered into prior to June 30, 1920, will be paid provided the recommendations contained in the report of the House appropriations committee are approved. The fortification bill as reported out carried a provision authorizing the expenditure of \$688,277.60, the sum requested by the Secretary of War. The majority of these contracts are only partly completed and the manufacturers advised the War Department that an extension was required.

Big Tractor Demand Foreseen in South

Diversification of Crops as Out- lined Creates Wide Need for Power Equipment

ATLANTA, Feb. 19—That the widespread program of crop diversification that is to be followed in the South this year will serve to materially increase the demand for tractors and power farming machinery, and that the effect of this program will be lasting so far as the future development and prosperity of the power farming industry is concerned in the South, is the opinion expressed by the various branch managers of the manufacturers, most of whom maintain Southern headquarters in Atlanta.

There is little or no doubt but that the South will greatly reduce its cotton acreage this year. This abandoned acreage will be devoted to food and feed crops, and with thousands of Southern farms following this program a broad market is thus created for power machinery, principally tractors. Very few of those farmers who have been devoting their time to cotton for a number of years, and who will this year abandon most of their cotton acreage and diversify their crops, are equipped with modern power machinery.

Agricultural experts of the various State departments contend that diversification, to be practiced with any degree of real success, almost necessitates the use of modern power equipment on the farm, and especially the use of one or more tractors for plowing and cultivating purposes, and a host of other duties that this machine is capable of performing. Without such equipment, it is pointed out, the shortage of farm labor will serve to greatly reduce the agricultural production, as compared with production which could be obtained under the modern and scientific methods of power farming.

States Urge Motorization

For that reason the State agricultural departments of the various Southern States are endeavoring to convince as many farmers as possible that power farming will solve the problem of greater production, enable them to get back on their feet and enjoy their full share of the prosperity. The whole idea is to get as many Southern farmers as possible to using tractors and power machinery before the 1921 spring planting season is at hand.

In the opinion of distributors in Atlanta who cover the whole Southeastern field, right now is the time for the tractor and implement dealers to go after the business. A cotton acreage reduction of from 33-1/3 to 50 per cent is an assured fact, and as the farmer is fully aware that his production will be materially lessened unless he does operate his farm along more scientific lines, he is open for conviction. Ex-

periences of some dealers the past few weeks, who are out after the business, has proven this to be a fact.

The Southern farmers have had this power farming idea drilled into them for the past three years until thousands of them are now "convinced." Power machinery is not so vitally important to cotton production, but it is vitally important to other crops, and the farmers who will practice diversification this year know it.

United States Tractor Adds \$300,000 Capital

MENASHA, WIS., Feb. 18—The U. S. Tractor & Machinery Co., at its annual meeting decided to increase the capital stock from \$500,000 to \$800,000 to accommodate the development of the business. During the year the manufacturing area has been increased from 7500 to 25,000 sq. ft. All of the facilities have been in production steadily, and since Feb. 1, some departments are operating overtime, and night shifts are in prospect. Branches have been established at Kansas City, Minneapolis, Springfield, Ill., and New York City.

W. O. Otis has been appointed sales manager to fill the vacancy caused by the resignation of E. J. Perkins. The tractor line has been increased from one to three models, and the line of governor pulleys from one size to six. Officers were re-elected as follows: President, J. G. Sailer; first vice-president, Christian Walters; second vice-president, George J. Mayer; treasurer, Dr. A. B. Jensen; secretary and assistant treasurer, G. D. Harris; assistant secretary, G. E. Lewis.

TO MAKE TRACTOR IN MEMPHIS

MEMPHIS, TENN., Feb. 21—The Ideal Tractor-Cultivator Co., organized under the laws of Delaware with an authorized capital of \$1,000,000 will manufacture a newly patented farm tractor at Memphis. The new firm will be located at the plant of the North Memphis Machine Works on the Belt line. The machine works will continue as before this line being added. J. P. Stanton will continue as manager of the plant. R. L. Tolston of Memphis is the inventor of the tractor. Officers of the company are Robert F. Carr, president of the Union Motor Car Co., president; vice-presidents, W. J. Meyer, Memphis; S. B. Street, Columbus, Miss.; R. F. Moorehouse, Springfield, Mo. R. N. Phillips, of Memphis is secretary and treasurer.

STOUGHTON APPROACHES NORMAL

STOUGHTON, WIS., Feb. 21—As the result of orders taken at the various shows held so far this year, the motor truck division of the Stoughton Wagon Co., is increasing its force and probably will be employing a normal force by March 1. Other departments, which manufacture farm wagons, manure spreaders and similar equipment, are still running at a relatively small part of capacity, but new orders are being received in an encouraging volume.

Tractor Study Shows \$4.21 Cost an Acre

Depreciation Shown High in New York State Analysis— Average Life Six Years

ITHACA, N. Y., Feb. 21—From studies of the cost of tractor operation made on eighty-seven New York State farms for the year 1919, the State College of Agriculture finds that the average cost of operation of a tractor without an operator was \$1.16 an hour. The average cost of a tractor operator was 50 cents an hour and the average cost of the two-bottom plow was 36 cents an hour, making the average tractor cost operator and plow \$2.02 an hour. The average rate of plowing on these farms was 4.8 acres in ten hours of work, making the average cost of tractor plowing \$4.21 an acre. With present fuel prices, this cost would be slightly increased, and varies as fuel costs advance or decrease.

The average annual cost of tractor operation on these farms was \$600 for tractor and operation. The largest single item of cost was depreciation, which amounted to \$187.25, while the average life of the tractors amounted to six years. Other costs in order of importance were: Tractor operation, \$166.63; fuel, \$137.38; repairs, \$44.25; interest, \$39.72; chore and other work on tractor by farm labor, \$38.94; lubricants, \$37.58; other costs, \$8.25.

The average number of hours worked by these tractors annually was 425, of which 321 hours were drawbar work and 104 hours belt work. This number of hours may be compared with the average number of hours worked by a horse on New York farms, about 900 to 1000 hours annually, or about three hours for each working day. The smaller number of hours worked by a tractor is due partly to the fact that the tractor completes the heavy work in a shorter space of time, and partly to the fact that it is less adaptable than horses. Many kinds of horse work cannot be done with advantage by the tractor, but most of the heavy work can. There is a growing tendency to apply the tractor to new tasks as operating experience increases.

Working Hour Range Wide

The number of hours worked by tractors on different farms ranged from 47 to 1277 for the year. Those farmers, who were able to keep their tractors busy at profitable work were able to reduce considerable the tractor cost. On nine farms on which tractors were used an average of 1001 hours each for the year, the average cost without the operator was 85 cents an hour, while on 31 farms on which tractors were worked an average of only 203 hours for the year, the average cost an hour was \$1.72 for the tractor without the operator. Including the cost of operation and plow the respective hour cost would be \$1.71 and \$2.58, and the respective costs of plowing an acre \$3.56 and \$5.38.

Ford Predicts 70,000 March Output

Dismisses Stories of Financial Need

Now Employing 15,800 Men in Alternating Shifts—Car Surplus Nearly Liquidated

DETROIT, Feb. 23—In an interview to-day with a representative of AUTOMOTIVE INDUSTRIES, Henry Ford declared that 15,800 men now are working in the Highland Park plant. Production ranges around 2200 cars daily. Finished cars, together with engines and parts for the assembly branches, constitute the Highland Park output.

Ford said the company had 95,000 cars in the hands of dealers when the plant closed just before Christmas and 30,000 more under construction at branches. The 30,000 were finished in January while the Highland Park plant was closed. Retail sales aggregating 57,000 cars in January liquidated the 30,000 in the assembly branches and 27,000 of the 95,000 in the hands of dealers.

Retail sales the first half of February were 42,000 and total production 35,000. If this ratio of sales continues, approximately 50,000 of the surplus will have been liquidated this month. Ford said the March dealer requirements would be 70,000 and the plant would build 3100 daily in March.

Uninterrupted operation and increases in the working force, as well as an output in conformity with demand, will depend entirely on steel prices, Ford said. The River Rouge plant has not been closed at any time and approximately 1000 men have been employed there continuously. The force was increased to-day to 2600 manning the blast furnaces, building tractors, and doing other work. The production schedule for tractors now is 100 daily.

Ford dismissed questions regarding financing by saying, "The best indication of our position is the fact we are going to build 70,000 cars in March and we could not buy materials and meet pay-rolls without money."

Future of Industry Assured

Ford is highly optimistic and has full confidence in the future of the industry as well as its continued improvement. He said the rotating system of employment would be continued until the main factory is again in normal production. All men who are to be retained permanently will be given an opportunity to get part time work. No wage reductions on specific jobs will be made, Ford said, and there will be no reduction in the minimum wage.

E. C. Kanzler, brother-in-law of Edsel Ford, apparently is functioning at the Highland Park plant as production man-

ager and Charles E. Sorensen as general manager. It is understood the policy of the company in future will be to abolish titles and that six or seven men will handle the work. They will specialize along certain lines but without titles.

NEWS BULLETINS

WASHINGTON, Feb. 24—Recommendations of the War Department for the disposal of surplus automobile equipment were adopted by the Senate committee on military affairs in reporting the army appropriation bill to the Senate to-day. The item, if passed without amendment, would to a large extent block efforts of Congressman Anthony of Kansas to dump army automobile equipment on the open market. The Senate bill specified that the total transfers and sales during the first six months of the present calendar year must not aggregate in excess of 10,000 motor trucks and 2000 passenger carrying automobiles.

The House bill, which carried the Anthony provision, required the sale and not transfer of motor vehicles. Brigadier General Lord told the Senators this week "the House committee put that word 'sell' in there with malice aforethought so that the money would go into the treasury" and Senator Lenroot, of Wisconsin, agreed with him. Under the proposed legislation now before the Senate all points of law are met because under existing law the War Department must give other Federal departments a choice of trucks.

NEW YORK, Feb. 24—A. B. Jones, formerly vice-president of the B. F. Goodrich Co., has been elected president of the Kelly-Springfield Tire Co. He will succeed F. A. Seaman who was acting temporarily as president. Seaman was elected a vice-president of the company.

CHICAGO, Feb. 24—The Stewart-Warner Speedometer Corp. has acquired the speedometer business and certain assets of the Van Sicklen Speedometer Co. of Elgin. The purchase did not include the capital stock which will retain its corporate entity. The Van Sicklen Co. is controlled by John N. Willys interests and has a new factory at Newark, N. J., which never was occupied.

NEW YORK, Feb. 24—An air mail plane which left San Francisco Tuesday arrived in New York yesterday afternoon. The mail was on the way only 33 hours and 20 minutes and the flying time was 25 hours and 53 minutes for the 2666 miles covered. The feat was made a success by a daring night flight from Cheyenne to Chicago through heavy storms. The flight was characterized as "a most momentous step in civic aviation."

Trucks Clear Snow in New York Storm

Motor Equipment Keeps Streets Open to Traffic in Season's First Test

NEW YORK, Feb. 23—Modern snow fighting equipment and a comprehensive plan of campaign enabled the Street Cleaning Department of New York to score a comparatively easy victory over the first heavy snow fall of the winter. The main arteries of traffic had been cleared by Monday night of the 13 in. which fell Saturday night and Sunday. More miles of streets had been cleared to-day than two weeks after the big storm last winter when the fall was not so deep. Four factors made the campaign a success. They were:

First—The equipment, consisting of 150 tractors, 350 trucks, over 600 push plows, about 150 four-wheel pull plows, 1800 department carts and about 850 contractors' vehicles which went to work very nearly on schedule time.

Second—The plan, begun last July, of training as many men as possible in four different schools in driving and handling this equipment made efficient work possible. By December these four schools had trained 649 men as drivers, so that all passed their licensing tests and became licensed chauffeurs.

Third—The entire city was divided into small zones, the equipment distributed in these zones, and every man assigned to his zone. At the same time each police station had a list of the snow fighting men living on the beats in that precinct, and the police were instructed to 'phone the police station the moment snow began to fall and get a list of these men.

Fourth—The street railway lines have about 3,000,000 sq. yd. of surface from which they were required to remove the snow altogether, not merely push it from the tracks. By agreement, the lines were given a full street, from houseline to houseline, approximating this area, which they were to clean entirely and which they did clean. In return, they were allowed to clear the tracks with sweepers and the city took care of the snow thus cleared.

Mishaps Prove Slight

There were only two hitches. Some of the push plows were installed on the heavy tractors without a bracing bar with which they were supposed to be fitted. As a result, five of these plows were put out of commission by the heavy tractors and one by one of the lighter tractors. The other mishap was on Sunday when gasoline supplies gave out for a time.

Goodyear Canvasses for Support of Plan

Officials Assigned to Visit Stockholders to Enlist Support in Financing Move

AKRON, Feb. 21—Many officials of the Goodyear Tire & Rubber Co. have been dispatched to all points of the compass to visit stockholders of the company and explain the proposed refinancing which will involve \$85,000,000, so as to have enough favorable proxy votes of stockholders to insure ratification of the plan at the special stockholders' meeting called for March 4.

Stockholders' proxies are not coming as fast as had been anticipated, it is said. Officials of the company in sending notices to stockholders urged them to appreciate the necessity of extreme promptness in returning signed and voted proxies. The slow returns from these notices is said to have prompted the company in sending many of its men on the road, to visit stockholders and gain their signatures to proxies for the March 4 meeting.

Stockholders are asked to vote on several important matters vitally affected by the proposed refinancing, and upon the ratification of which it is said the definite consummation of negotiations hinges. Unless the plan is accepted by both stockholders and merchandise creditors it is recognized that the only alternative is a receivership.

It is admitted openly in Akron that the whole future of Goodyear depends upon approval of the financing plan by stockholders. The Goodyear company is so big, the ramifications of its interests are so far-reaching, and its place in the American industrial structure is so prominent, that anything looking to its failure would amount to nearly a calamity. Two months ago stockholders agreed to a plan of issuing \$50,000,000 first mortgage bonds, but it having been found that other securities must be issued in order to completely satisfy the situation, additional consents must be secured to the new plans involving \$85,000,000. The failure of Goodyear would amount to a business disaster which would be so far-reaching as to affect many other lines of industry.

Hesitate On Added Burden

It is also stated that stockholders having already approved the \$50,000,000 refinancing plan, feel considerable hesitancy about giving new consent to added encumbrance of the company's property and inventories without first having it explained to them exactly why such additional financing is necessary.

Since the issuance of the annual statement of Oct. 31, 1920, the company's indebtedness, including contingent liabilities, has increased nearly \$66,000,000, largely by reason of delivery of raw materials contracted for at high prices, and also by reason of further depreciation of materials delivered and covered by con-

tracts for future deliveries. In December it was estimated that the company's deficit was \$24,400,000, and that at the present time the additional estimated depreciation of materials contracted for but not yet delivered is \$18,247,000.

The statement on present debt and capitalization shows a bank debt of \$44,981,500. This includes \$18,825,000 as a special secured loan negotiated last November, \$13,594,000 including other obligations secured by rubber used in current operations, and \$12,202,500 of unsecured notes and other commercial paper. Other secured notes payable are listed at \$467,830, and bills receivable discounted by the company are listed at \$1,970,000.

Merchandise Debt \$11,305,104

The merchandise debt is listed at \$11,305,104. Taxes will amount to \$4,387,026, preferred stock subscriptions of employees to be refunded of \$318,701, and miscellaneous indebtedness of \$413,573. With other contingent estimated obligations of \$2,120,556, the company's total indebtedness so listed is placed at \$65,964,290.

Present commitments for future deliveries of merchandise on which specifications and prices have been fixed total \$54,959,503. This sum includes \$7,200,740 on rubber, \$5,664,000 on cotton, \$41,879,763 on fabric, and \$215,000 on other materials. In addition the company estimates its depreciation of materials covered by commitments, not heretofore written off, of \$18,247,000.

The approximate capitalization is \$65,000,000 of 7 per cent preferred stock and \$61,000,000 of common stock.

Bankers Extend Loan

NEW YORK, Feb. 23—The loan of \$18,825,000 which was made to the Goodyear Tire & Rubber Co. several months ago by a banking syndicate headed by Goldman, Sachs & Co. and which matured Feb. 15, has been extended for 30 days with an option on a further extension of 60 days.

NEW CASTLE RECEIVER NAMED

NEW CASTLE, PA., Feb. 18—E. W. Beadel, local manufacturer, has been appointed receiver for the New Castle Rubber Co., in a meeting of creditors this week. The company failed during the recent financial reorganization of the Goodyear Tire & Rubber Co., although not an allied property. A quantity of Goodyear stock was listed as a large portion of its assets. F. A. Seiberling was not individually interested in the company, but it is understood that his son had a prominent part in the organization of it.

FILE NEW FORT WAYNE SUIT

FORT WAYNE, IND., Feb. 19—Another suit on account and for the appointment of a receiver has just been filed against the Fort Wayne Tire & Rubber Co. The complainant is the Quaker City Rubber Co. The demand in the complaint is \$35,000, making a total of \$136,000 demanded from the company in four suits.

Kalamazoo Plants Increase Operations

Fuller Finds Healthy Tone to Business—Barley Looks to Good Sales Year

(Continued from page 475)

since the shows in New York and Chicago" said Handley. "We have made numerous favorable distributing connections and look for a steady increase in our business. Our new car is well received wherever shown and I predict a ready market for all we can make this year."

Frank D. Fuller, president of Fuller & Sons Mfg. Co., reported that business is quiet, but enjoys a more healthy tone than anytime within the past three months.

"We are equipped to do a large volume of business" said Fuller. "That is shown by the fact that during the first nine months of 1920 we were able to produce three million dollars worth of truck transmissions. We are operating on part time schedule at this time, but are planning to steadily increase our working force."

The Barley Motor Car Co., makers of the "Roamer," enjoyed their best year during 1920 and are now preparing for a good run this season. It is expected to nearly equal the 1920 production. The car is meeting with added favor year by year.

The Dort body plant is now ready for a large production when the demands require it. The equipment throughout is high class and the two big structures have been laid out so as to provide the greatest efficiency in operation. A small force of men is now employed and Will Henderson, manager, believes that many more hands will be required in the near future.

While it is particularly quiet in the truck and tractor lines, both the Kalamazoo Motors Corp. and the Reed Foundry & Machine Co., makers respectively of the "Kalamazoo" truck and the "Reed" tractor, look forward to an early revival in trade.

TO EXTEND FORT WAYNE PLANT

FORT WAYNE, IND., Feb. 19—The General Electric Co. has purchased sixty acres of ground for the expansion of its local plant, which during normal business conditions employs about 6000 men. The local plant makes a large quantity of electrical equipment for automotive concerns.

WESTERBURG RECEIVER NAMED

NEW YORK, Feb. 23—J. N. Warren has been appointed temporary receiver for C. H. Westerburg & Co. of this city. He is serving without compensation in an attempt to bring about an agreement among the creditors which will forestall attempts to have the company declared bankrupt. The assets of the company virtually balance the liabilities.

Army Starts Sale of Surplus Cars

Anthony Bill Faces Probable Defeat in Senate—Legislation May Be Delayed

(Continued from page 474)

and 1000 automobiles. His move has been met with proposed bills requiring the transfer to the Bureau of Public Roads and subsequently the sale to State highway departments at a nominal sum.

It is understood here that Senators will block the Anthony amendment when the Army bill is called up, and substitute a proviso authorizing transfers. According to Senate leaders, there is a chance that President Wilson will veto the Army appropriation measure because it contains certain features objectionable to him. In that event, it would appear that the bill must go over until the extraordinary session of the Sixty-seventh Congress which will be called in March or early in April. The Army will have sold a large share of the equipment and the Anthony amendment rendered useless.

It is likely that the next sales of surplus equipment will be held at Camp Jessup near Atlanta, a concentration camp for the Motor Transport Corps; El Paso, and San Antonio, Texas for equipment held on the border, Jeffersonville, Ind., for equipment owned in the Middle West, San Francisco for machines held in the West. The Motor Transport Corps also has depots at Columbus, O., New Cumberland, Penn., Perth Amboy, N. J., Schenectady, N. Y., and Norfolk, Va. They have not yet determined where the next sale will be conducted.

It is customary to allow bidders to inspect the equipment for three days prior to sale and then bid according to auction lot numbers listed in the official catalogue. Inasmuch as machines are not ready for operating under their own power, the successful bidders are urged to make preparations for immediate removal as the liability is assumed immediately after the sale. The sales are conducted by professional auctioneers. Judging from the prices obtained at the Baltimore sale, the auctions throughout the country will net the Government several millions.

SEEK REPEAL OF PUMP RULING

MILWAUKEE, Feb. 21—An appeal by manufacturers of certain types of gasoline pump equipment from the ruling made a year ago by the Industrial Commission of Wisconsin, prohibiting the use of visible tank pumps, is under consideration. It is said there is small hope for a repeal of the order. Manufacturers of visible tanks claim it is to the best public interest that the visible type be permitted, so the consumer may be able to determine for himself if he is getting the amount of gasoline he pays for. The opposition, headed by Frank R. Daniel, chief inspector of the Wisconsin Fire In-

spection Bureau, contends that the number of filling station fires has been increasing; that in other States serious fires and catastrophes occurred from the use of visible tanks and electrically driven pumps, and that there have been cases where the rays of the sun caused losses by ignition from the focusing of the rays through the glass tanks.

General Motors Assets Increase \$156,100,479

NEW YORK, Feb. 21—Estimated consolidated balance sheet of the General Motors Corp. and subsidiaries as of Dec. 31, 1920, compares as follows:

ASSETS		
	1920	1919
Real estate plant eq.	\$248,000,000	\$153,803,642
Misc. inv.	63,000,000	53,398,491
Cash	49,278,000	48,231,200
Lib. bds., etc.		213,219
Sight drafts	11,000,000	
Nts. & accts. rec., etc.	37,661,000	37,694,267
Mkt. Secur.		989,448
Inventories	166,000,000	128,696,652
Def. exp.	5,090,000	3,301,713
Goodwill pat., etc.	22,724,000	20,323,889
Total	\$602,753,000	\$446,652,521
LIABILITIES		
Db. 6% stk.	\$56,368,100	\$68,339,300
Db. 7% stk.	25,153,500	
Pfd. stock	16,183,400	16,957,000
Com. stock	356,300	153,411,000
Com. stock	205,170,550	
Pur. money bonds	1,443,000	150,000
Pur. money notes	9,840,000	
Bonus stock awarded		7,848,570
Sub. stock & capital	1,788,000	1,585,344
Accts. pay.	25,794,000	37,846,813
Notes pay.	72,225,000	28,652,318
Taxes, payrolls etc.	12,000,000	11,521,771
Pf. divs. due	1,025,000	829,882
Res. for dep.	35,742,000	
Res. for tax, etc.	4,500,000	36,262,473
Res. for empl. bonus	1,080,000	
Res. for cont.	6,552,970	4,546,653
Surplus	127,531,180	78,641,897
Total	\$602,753,000	\$446,652,521

Baltimore Buyers Pay \$40 to \$2400

(Continued from page 474)

John C. O'Brien, general manager of the Baltimore Automobile Trade Association, said the association's members protested to the Government because of the injustice of bringing machines from all over the country to be sold in this city. This, the dealers believe, would have a serious effect on future business here. They sought to have the Government sell the cars at the various Motor Transport Camps instead of bringing them to Baltimore.

FULLER REELECTS OFFICERS

KALAMAZOO, MICH., Feb. 21—Fuller & Sons Mfg. Co. report the result of their annual election as follows: President, Frank D. Fuller; vice-president, L. C. Fuller; secretary, Walter P. Fuller; treasurer, W. E. Upjohn. The above and S. N. Bickerstaff constitute the board of directors.

Metropolitan S. A. E. Visits Cooper Union

Laboratory Equipment and Testing Machines Discussed—Frame Design Merits Considered

NEW YORK, Feb. 18—The regular monthly meeting of the Metropolitan Section of the Society of Automotive Engineers was held last night in the Cooper Union Laboratories. Members of the section were given an opportunity to inspect the laboratory equipment, much of which was in operation. An automobile engine fitted with pressure indicating devices was run on the dynamometer stand. Two O'Kill pressure indicators were used to determine the maximum compression and explosion pressures and a Hospitalier manograph was arranged to project an indicator card on a screen provided for the purpose. The relative merits and utility of the two devices were later discussed.

In the strength of materials testing laboratory tension, torsion and fatigue testing machines were seen in operation, two of these being arranged to draw autographic records of the tests.

The paper of the evening was by Ethelbert Favory, who conducts the course in motor vehicle engineering at Cooper Institute. His talk dealt with a method of analyzing the stresses in automobile frames due to loading and road shocks, and included the development of a stress and shear diagram. The discussion which followed indicated that there is much interest in the matter of frame design.

Most of those who spoke appeared to favor rigid as against flexible or semi-flexible types. Three point suspension of the frame on the axles and of the engine in the frame, was favored by some speakers as tending to reduce distortion. One speaker stated that the tendency in passenger car design is toward deeper sections and stiffer construction in general.

Both the meeting and the dinner which preceded it were well attended.

COST MARK BILL OPPOSED

NEW YORK, Feb. 23—The Rubber Association of America has urged its members to oppose vigorously a bill introduced in the Minnesota legislature which would require the marking of merchandise with the manufacturer's cost, price at which it was sold to him, name and address of its distributor and the retail price of the article.

RESUME FORT WAYNE BUILDING

FORT WAYNE, IND., Feb. 19—The Greater Fort Wayne Development Co., which is putting up the homes to house the workers who will be employed at the new International Harvester plant here, is going right ahead with its work. It is expected that work on the Harvester plant will be resumed within a couple of months.

Decline Road Action Under Present Plan

Congress Asserts Highway Funds Now Being Wasted—Will Demand Results

WASHINGTON, Feb. 18—Efforts to force a continuation of Federal aid appropriations for highways by a rider on the Postoffice appropriation bill were defeated in the Senate to-day and assurances given that the proposed plan for a national system of highways as advocated by the automotive industry and organized automobile owners would be considered at the extraordinary session of the next Congress. Senator Thomas, Democrat, of Colorado, supported Senator Townsend, Republican, of Michigan, and chairman of the Senate committee on Postoffices and Roads, in opposing the amendment of Senator Swanson of Virginia. The Colorado Senator's threat to filibuster indefinitely against the proposed amendment served its purpose and the Senate rejected the Federal aid proposition.

Senator Swanson sought to persuade the Senate to accept his amendment which was the Federal aid bill passed in the House last week. He contended that 43 State legislatures would adjourn in March without knowing what the Federal Government was going to do in connection with road improvement. The Bureau of Roads data showing that on December 31, 1920, \$149,683,107 was either under actual construction or completed leaving \$117,066,893 on that date available for new contracts was submitted to the Senate.

During the debate on the amendment, Senator Townsend advised the Senate that the committee on postoffices and roads would undoubtedly report on the national highway system measure and other road measures now pending in committee. He expects that action will be taken by Congress before July 1. He pointed out that it was necessary to devise a scheme to get results for money spent on roads instead of wasting it under present method of distribution.

ARMY AIRCRAFT BILL OFFERED

WASHINGTON, Feb. 19—Senator New of Indiana has introduced a joint resolution which would authorize the Air Service of the Army to conduct extensive investigations as to the need of new designs in aircraft engines and other equipment used in aerial offense against sea-craft. The legislation directs that obsolete warships should be turned over to determine the effects of missiles dropped from aircraft. Airplane builders expect that the tests will lead to more extensive use of bombers.

AEROMARINE TO OPEN SCHOOL

NEW YORK, Feb. 21—The Aeromarine Engineering & Sales Co. will open a training school for aviators this spring at Raritan Bay, Keyport, N. J.,

according to C. F. Redden, president of the company. It will be operated in connection with the sale of surplus navy flying boats recently taken over by the Aeromarine company. Students at the Aeromarine school will receive instruction in both land and water flying, giving particular attention to straight flying and navigation necessary in operating passenger carrying machines. They also will be taught practical airplane construction.

Price Guarantee Merits to Be Ruled on Singly

WASHINGTON, Feb. 18—Economic readjustment has forced the Federal Trade Commission to adopt an open attitude in regard to guarantees against price declines in business. It was announced this week that the Commission would consider the merits of the practice in specific cases rather than consider the subject in a general way.

The Commission finds that so many complaints have been received about the practice of manufacturers guaranteeing commodities in the hands of wholesalers against decline in price, that an inquiry showed the impossibility of dealing with the matter in its broad aspects. The Commission will consider the legality of each case and its effect on business.

Truck Limit Ruling Restrained by Court

YOUNGSTOWN, OHIO, Feb. 18—Scoring a partial victory against the Mahoning County commissioners in a fight to prevent restriction of heavy duty truck operations, attorneys for the Youngstown Automobile Dealers Association have obtained from the Appellate Court a temporary restraining order, preventing the commissioners from enforcing their bridge weight limitations. Judge Cooper in Common Pleas Court this week dissolved a temporary injunction which he had granted three weeks ago. In raising the bar, Judge Cooper issued a decision supporting the rights of the county commissioners to limit the bridge weight capacities, but based this ruling on his interpretation of statutes that this action could be taken only to safeguard life and property, and that such action could be effective only for a "reasonable time" in which to carry out repairs and reconstruction.

UNION RETAINS OFFICERS

BAY CITY, MICH., Feb. 18—No changes were made in the officers or directors of the Union Motor Truck Co., which met at its annual meeting a few days ago. During the past year earnings were such as to enable the company to pay charges and dividends on its preferred stock and to leave a surplus over all liabilities. The company bought more than \$270,000 worth of materials from Bay City merchants and paid out more than \$250,000 in wages. Production has been cut down, but there has been no complete shut down.

Little Car Claims Asserted Falsities

Six or Seven Cars Made All Different Is Testified—Blacksmith Made Parts

DALLAS, TEX., Feb. 19—Blacksmiths made a great many of the important parts of the first automobiles assembled at the plant of the Little Motor Car Co., according to testimony given in Federal Court here at the trial of W. S. Livezey, president of the concern, and other officers and promoters charged with using the mails to defraud.

The company was thrown into the hands of a receiver and the arrest of Livezey and others followed more than a year ago, after thousands of persons had subscribed to stock in it at \$1 and \$2 a share.

C. E. Peters, consulting engineer of Cleveland, who came to Dallas early in 1920 to superintend the assembling of the first cars, said he found many important parts had been made by a Dallas blacksmith. These included spring pads and spring clips, the steering wheel link and one of two brake drums. Of the two brake drums, he said, one was a Ford part and the other was a home-made affair, and neither was suitable for the brake design called for. The stability, workmanship and construction of the first cars, he said, were very crude.

"There were six or seven cars on the floor," he declared, "and no two of them were alike."

The officers of the concern, he said, took little interest in the work and never consulted him or advised with him. One of them, he said, put a wooden frame on one car and spent the rest of his time painting his own touring car which he had recently purchased.

In advertisements it was claimed that \$1,000,000 worth of material was on the ground. This statement, employees have testified, was utterly false. Other claims in a letter to a prospective purchaser were that the company had so many orders it could not find time to answer mere inquiries.

FISHER UNIT NEAR COMPLETION

CLEVELAND, Feb. 21—The mammoth body building plant of the Fisher Ohio Co. is nearing completion and is expected to be in operation on March 1. The plant, which is one of the largest industrial units in the State and is said to be the last word in construction for automobile body building, is equipped to do a business of \$20,000,000 a year. The Detroit company will provide the new company with that much business.

The Fisher corporation guarantees the 8 per cent dividend on the Fisher Co. from April, 1920, until July 1, 1922, the first payment of which was made Jan. 1. After that time it is expected that the Ohio company will be able to keep up its dividends on its preferred stock.

INDUSTRIAL NOTES

Stout Engineering Laboratories, Detroit, in which the new Stout batwing monoplane is being produced, are being moved this week to a large building on Beaubien Street. The factory now has \$500,000 worth of orders booked, according to officials, and all of these are scheduled for delivery this year.

United States Motor Truck Co. has established a distribution connection in Kansas City. The new company is affiliated with the St. Louis sales company and the Marion County Motor Co. of Centralia, Ill.

American Motor Body Co., which owns the Wadsworth Mfg. Co. of Detroit, is now working 500 men on an old order for Ford Sedan bodies. It has employed 150 men in the finishing room since it reopened, Feb. 1. It normally employs 3500.

Miller Rubber Co. has removed its New York export branch to 121-125 Duane Street, where it will have larger office and storage facilities. The export headquarters will remain in Akron.

Van Briggie Officials Are Indicted for Fraud

INDIANAPOLIS, Feb. 21—Lilburn H. Van Briggie, president of the Van Briggie Motor Device Co., has been arrested on a charge of using the mails in a scheme to defraud, as a result of an indictment returned last Monday to Judge Anderson by the Federal grand jury. He was released on bond of \$10,000 and will be arraigned in Federal Court March 7. Henry S. Rominger, treasurer, and Charles A. Taylor, sales manager, also were indicted and arrested on similar charges.

The defendants are charged with making false representations as to the financial condition of the company, which manufactures Van Briggie carbureters and shock absorbers for Ford automobiles, to prospective purchasers of the capital stock of the company. Van Briggie is accused of having purchased large blocks of stock in his company and then selling it to third parties at a high price, representing that it was treasury stock. It is also alleged that he failed to pay for the stock so taken by him.

Charge Fraud in Sale of Victor Truck Stock

BENTON HARBOR, MICH., Feb. 19—E. E. Edgar and John S. Watt of Harvey, Ill., have filed suit alleging misrepresentation and fraud against the Victor Truck Co. of St. Joseph, Mich. The suit is said to be the outcome of the failure of the Baroda Commercial Bank a short time ago. One of the principal defendants is A. E. Rick, president of the defunct bank, from whom a full accounting is asked by the plaintiffs.

The petition asks the appointment of a receiver and a full accounting from F. D. Allis and C. C. Van Wagoner, officials of the truck company.

The petition recites that Van Wagoner by dubious methods induced the plaintiffs to invest heavily in stock in the company. Edgar and Watt, according to the petition, were to be distributors in Wisconsin, Illinois and Minnesota, and they allege they deposited \$500 for parts and supplies and bought two trucks for \$3,200 on the statement of Van Wagoner that the St. Joseph Co. was financially sound and producing trucks in marketable quantities. These statements, the plaintiffs allege, were untrue.

Petitioners also allege Van Wagoner approached them in January of this year and persuaded them to buy 200 shares or two-thirds of the common stock of the company owned by G. A. Fitch of St. Joseph for \$10,000. Half of the money was paid in cash January 8 and a 60-day note was given.

Kelly-Springfield Tire Shows \$7,721,901 Profit

NEW YORK, N. Y., Feb. 23—Gross profits of \$7,721,901 the second largest in the history of the company, are shown in the annual report of the Kelly-Springfield Tire Co. for 1920. Net profits were \$3,430,914, also the second largest ever reported, although unusually large deductions were made leaving a balance of only \$1,959,293 before providing for taxes, compared with \$2,853,571 for 1919. The deductions in 1920 amounted to \$2,076,152 which included \$500,000 for fluctuations in inventory valuations as well as for losses on Liberty bonds and deduction of fixed and miscellaneous charges.

After payment of preferred dividends but before allowance for taxes, the amount available for common stock was \$1,296,255 or approximately \$4 a share on \$8,061,000 worth of common stock outstanding Dec. 31 as compared with 50 per cent on \$5,361,978 common in 1919.

President Frederick A. Seaman stated that the company had no supplies or contracts for raw materials at former high prices and is in a position to take advantage of low levels for future requirements. The first nine months of 1920 showed marked improvement over the same period in 1919 but there was a marked falling off in business for the last quarter. Completion of the new plant at Cumberland, Md., has been delayed but it is expected to be opened during March.

FORD PATENT SUIT FILED

BOSTON, Feb. 18—A bill in equity was filed in the Federal District Court here by William B. Moses of Watertown against the Ford Motor Car Co. of Detroit, and Laline & Partridge, Inc., 1255 Boylston Street, charging an infringement of patent rights in certain improvements in starting, generating and lighting apparatus, and seeks temporary and permanent injunction restraining the joint defendants from causing to be made or sold or offered for sale Ford motor cars containing an infringement on his invention.

METAL MARKETS

THE nearer we come to the end of the padding that war inflation has wrapped around iron and steel prices the more obvious becomes the irremovable character of that part of the swollen levels which is due to high freight rates. It costs to-day upward of \$10 for freight to assemble the iron ore, limestone, fuel, etc., necessary to produce a ton of pig iron. In 1897 and 1898 pig iron sold for less money per ton to the consumer than it costs the blast furnace in freight to-day for the raw material to produce a ton. Until the Interstate Commerce Commission applies the pruning knife to freight rates, there is no possibility of a recession to pre-war prices, even though every other cost ingredient may have been pared to what it was before the war. With reports current that a round tonnage said to approximate 25,000 tons has been taken off the market by speculative interests at a price below \$25 for basic, the question presents itself whether the pig iron market can go any lower considering that, deducting the \$10 freight on raw material, the blast furnace that sold this tonnage will receive less than \$15 for raw material, labor and overhead. Noteworthy also is the character of this transaction, the buyers being speculators who will hold the iron for an advance and the sellers steel producers who do not need it because of the idleness of most of their steel making capacity. In other words, large financial interests believe that, until freight rates are reduced, the pig iron market can not go lower. From the point of view of the automotive foundry buyer, the differentials quoted on foundry and malleable over basic prices are still somewhat askew. To understand clearly the situation in the steel market which newspaper reporters seek to exploit in the only way such material can be turned into "first page stuff," i. e., a battle royal between the Corporation and the independents, it must be borne in mind that the Corporation, in the very nature of its organism, can not alter its price and operating policies as frequently and swiftly as the smaller interests. It is now shipping steel at somewhat higher prices than those quoted in the open, "independent" market to many consumers to whom it sold much more steel at the same prices last year, while the "independents" were then asking considerably higher levels.

Pig Iron—Middle West automotive foundries have been bidding \$26 @ \$27 for foundry and malleable, valley basis, producers being apparently disposed to consider negotiations with such bids as a basis and countering with offers of \$1 to \$2 higher. The situation has narrowed down to a case of haggling over price in each individual transaction.

Steel—Somewhat better inquiry is noted for cold-rolled strip steel from automotive sources. Cold-finished steel bars are sought at concessions which many makers are unable to grant because they depend for their hot bars on the Corporation. Pittsburgh reports state that the Ford Motor Co. and other Detroit passenger car builders are issuing more shipping instructions for sheets.

Aluminum—While some odd lots of foreign 98 to 99 per cent metal are offered at 24c., the general "outside" quotation is 25c., with demand light.

Lead—The chief interest has reduced its official quotation to 4.50c., New York and East St. Louis. The "outside" market is 4.25c., East St. Louis.

FINANCIAL NOTES

Savage Arms Co. reports total earnings for 1920 as \$117,000, equal to \$1.35 a share on the \$7,748,000 of common capital stock outstanding. In 1919 the company earned \$2,032,000, which was equal to \$19.28 a share. After the payment of common dividends, including the extra payments declared during the year, the deficit for 1920 amounted to \$631,000. In 1919 a surplus of \$643,000 was reported.

Saxon Motor Car Corp. shows a gain in assets as of Dec. 31 over April 1, 1920, of \$484,675. This is represented principally in inventories which increased from \$747,493 to \$1,770,036, and deferred charges, and machinery, trucks and equipment. Cash decreased from \$1,091,151 to \$62,561. A decrease in surplus is shown from \$4,402,816 to \$4,286,700.

Curran Motor Products Co., Detroit, has been organized with a capital of \$100,000 to market automobile accessories, chiefly the inventions of Dr. E. T. Curran. Dr. Curran is president; W. N. Nahikian, vice-president; P. M. MacKay, secretary-treasurer, and P. T. Quinn, sales manager.

Dunlop's Ltd. the British tire company which is the parent of the Dunlop American company, proposes to issue debentures amounting to 3,000,000 pounds Sterling at 98 with interest at 8 per cent. They will run for 20 years with annual drawings for retirement at 105.

Curtiss Aeroplane & Motor Corp. reports a net loss for 1920 of \$1,756,582, which includes full depreciation on plant, securities owned, patents receivable and inventories, as well as cost of cancellation of contracts for material. It is declared no new financing is necessary.

Davis Steam Motors, Inc., Detroit, with a capital of \$100,000 in shares of \$10 par value, has been organized to market a steam engine for use in both passenger cars and trucks. The incorporators are Merrill Davis, E. M. Bliss, F. D. Siebert and A. B. Eggert.

American Bosch-Magneto Co. has reduced disbursements on its capital stock from \$2.50 to \$1.25 a share. This places the stock on a \$5 annual dividend basis as compared with the previous rate of \$10.

L. V. Fletcher & Co., New York, manufacturers of carbureters, has filed a petition in bankruptcy, with liabilities of \$39,968 and assets of \$14,369.

Ajax Rubber Reports \$177,920 Loss in Year

NEW YORK, Feb. 21—The report of the Ajax Rubber Co. for the year ended Dec. 31 last, shows a loss of \$177,920 after depreciation charges. This compares with a net profit of \$2,201,267 for 1919. The balance sheet shows inventories of \$7,408,968; notes and accounts receivable of \$3,959,947; cash, \$301,990, and deferred charges of \$336,205. The total assets are \$18,376,854. The liabilities include \$6,145,000 in notes payable, and \$528,292 in accounts payable.

Horace DeLisser, chairman of the board, says in a report to stockholders that the company is in a favorable position because of the comparatively small and evenly balanced inventory as well as because of the small amount of commitments placed for future deliveries of raw materials. At the end of the fiscal

year this amounted to only \$220,000 for rubber and \$1,767,000 for fabric. DeLisser adds that in practically the first year of the company's efforts toward an export business, there were shipments of more than 1,100,000 Ajax tires and tubes to 60 foreign countries.

Apex Seeks Extension; Reorganization Planned

YPSILANTI, MICH., Feb. 23—Creditors of the Apex Motor Corp. have been asked to grant an extension of time for approximately a year to permit thorough reorganization of the company on a basis of reduced overhead and economical operation. The directors have accepted the resignation of O. W. Heinz as president and general manager and elected H. T. Hanover in his place. George P. Listman of Seattle has been elected a director.

A statement sent out by the company states that its financial condition was serious at the time the change of management was made, but that the United Finance Co., the largest creditor, with a claim of approximately \$500,000, has agreed to an extension of 30 days to learn the views of other creditors and prepare a financial statement. If the other creditors will agree to an extension, the finance company will advance sufficient funds to get back into production to fill the orders on hand. The agreement with the finance company provides that all future business must be on a C. O. D. basis.

The directors have repudiated a re-financing arrangement entered into by Heinz with C. B. Haffenberg. This arrangement would have provided for the sale of stock and the directors would not permit this action in view of the company's financial condition.

Federal Truck Report Shows \$806,812 Surplus

DETROIT, Feb. 17—Federal Motor Truck Co. reports total sales of \$10,628,742.09 and profits of \$745,878.66 for the year ended Dec. 31. Liabilities aggregating \$4,525,340.50 include:

Notes and Accounts Payable.....	\$ 352,734.39
Dealers' Deposits.....	31,843.93
Land Contract.....	335,360.00
U. S. Government Claim.....	359,091.87
Reserves for Depreciation, etc....	577,649.72
Capital Stock.....	2,000,000.00
Surplus.....	806,812.76

Assets include:

Cash.....	\$ 163,293.11
Notes Receivable and Acceptances	68,040.11
Accounts Receivable.....	160,770.88
Securities.....	192,505.26
Plant Accounts.....	1,383,248.90
Merchandise Inventory.....	2,497,398.25
Prepaid Expense.....	60,083.99

AJAX SEEKS PLANT SITE

BOSTON, Feb. 21—The plant location of the Ajax Motors Corp., Boston's only motor vehicle builder, has not yet been definitely determined. Pending the construction of its own plant, its products are being assembled at the Tracy plant in Rutherford, N. J.

Bank Credits

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, Feb. 24—The local loan market again eased toward the latter part of the week. Call money ruled at 7 per cent with a range of 6 per cent to 7 per cent as against a range of 7 per cent to 8 per cent the week before. A feature of the week was the reappearance of an "outside" market, where call money could be had at 6 per cent. There was little trading in time money, the supply of which was light until the latter part of the week. Sixty and ninety day paper was quoted at 6½ per cent to 7 per cent, and the longer maturities at 6½ to 6¾ per cent. Corresponding rates for the previous week had been 7 per cent and 7¾ per cent respectively.

Although the excess reserves of the New York Associated Banks declined \$7,625,180, the loans and deposits continued to decline. Loans at \$5,001,150,000 marked a decline of \$20,216,000 from the previous week. Net time deposits declined \$11,725,000 and net demand deposits decreased nominally.

The week-end statement of the New York Federal Reserve Bank showed a greatly improved reserve position for the local Bank. Gold reserves increased \$25,499,000. Total bills on hand decreased \$40,966,000 and total earning assets declined \$43,266,000. Net deposits declined \$21,101,000. The ratio of total reserves to Federal Reserve note and net deposit liabilities combined, increased from 39.4 per cent to 41.7 per cent. This ratio is higher than that for any week since last September.

The Federal Reserve Banks as a whole showed the same marked improvement as the New York bank. Gold reserves increased \$10,674,000 while Federal Reserve notes in circulation declined \$12,972,000. Federal Reserve Bank Notes declined \$4,747,000. The ratio of gold reserves to Federal Reserve notes in circulation after setting aside 33 per cent against net deposits, increased from 57.6 per cent to 58.5 per cent. Bills discounted and secured by Government war obligations were down \$21,495,000 and total bills on hand \$50,107,000. Total earning assets decreased \$51,923,000 and net deposits \$25,535,000.

The stock market last week was dull and irregular with net gains, however, practically offsetting the losses. The bond market was also very quiet and was marked by fewer new issues than have been characteristic of recent weeks.

STORM KING EXTENDS PLANT

HARTFORD, WIS., Feb. 19 — The Storm King Mfg. Co. of Hartford, Wis., manufacturer of patented curtains for Ford and other cars for cold weather equipment, has been obliged to take over larger quarters to accommodate the expansion of its business and provide more adequate facilities. As rapidly as possible the output is being increased to 500 sets of curtains per month.

Men of the Industry

E. P. Chalfant, one of the veterans of the motor vehicle industry, has voluntarily taken an indefinite leave of absence from Automotive Products Corp. of New York, an export house which he organized two and a half years ago as an ally of the American Steel Export Co. He is also president of the Gill Mfg. Co., Chicago, and president of the Gill Piston Ring Corp., New York, and will hereafter devote himself actively to the affairs of these two companies, making his headquarters at the New York branch, 1864 Broadway.

A. D. Williams has assumed charge of sales for "X" Laboratories, manufacturers of "X" Liquid, and will be located with headquarters at their New York office. Williams formerly was associated with the American Chain Co., Bridgeport, Conn.; the F. Hersh Hardware Co., Allentown, Pa., and the last few years has been field manager for the Bethlehem Spark Plug Corp.

E. E. Westman, for the past two and one-half years director of purchases of the Premier Motor Corp. of Indianapolis and for many years connected with various automobile concerns of that city, has severed his connection with Premier to become secretary and treasurer in charge of sales for the Kant Kut Tube Products Co., Indianapolis.

Fred Rufenacht has purchased the plant of the Bucyrus Rubber Co., New Philadelphia, Ohio, and it is thought he will organize a company to operate it as the Crawford Tire & Rubber Co. Rufenacht is a coal operator of New Philadelphia and was an officer and stockholder of the Bucyrus company. Philip H. Heater has been appointed manager.

W. G. Thompson has been elected president of the Thomart Motor Co. of Akron and Kent, Ohio. The company was organized last April and started limited production in December of 1-ton speed trucks. James L. Stewart has been elected vice president and general manager, and B. A. Shriber, secretary and treasurer.

Jack Neely, assistant sales manager of the Barley Motor Car Co. for several years, has resigned his position and will be associated with the Studebaker Motor Car Co. He will be assigned to one of the numerous factory branches of the latter company, assuming his new duties as a branch manager about April 1.

R. S. Jemison, who has been connected with the advertising department of the Miller Rubber Co., has been appointed advertising manager of the Oldfield Tire Co., and has moved his headquarters from Cleveland to Akron. Jemison is widely known throughout the south as a writer on sporting topics.

Joseph E. Burns has succeeded R. G. Ewell as sales and advertising manager of the Allen Motor Co., Columbus. He was formerly territorial representative for the company and previous to that had been connected with the educational bureau of the Cole Motor Car Co.

F. S. Warren, for the last five years sales manager of the Booth Felt Co., Inc., New York, and previous to that for two years New York representative of the Advance Felt & Cutting Co., Chicago, has gone into business for himself in New York.

C. R. Miller has resigned as general manager of the Allen Motor Co., Columbus. He was formerly works manager at Willys-Overland and general manager of Miami Cyclex & Mfg. Co. His plans for the future are not announced.

Fred Wellman, for two years advertising manager of the National Motor Car & Vehicle Corp., has resigned his position to join the National Motor Sales Co. of Chicago, distributors of National cars, in the capacity of sales manager.

Ewart C. Hugh, formerly European traveling representative of the All American Truck Co., Chicago, has formed the Hugh Co., Buffalo, which will manufacture metal products for the automotive industry.

G. R. Harris has resigned as secretary-treasurer of the Troy Wagon Works Co., Troy, Ohio. W. J. Murray has been appointed general manager and H. H. Tamplin new secretary-treasurer.

Victor Greiff, E. E., who joined the American Bosch Magneto Corp. a year ago to install a research laboratory, has completed the work and returned to his home in New York City.

George J. Blanton, who for the past four years has been connected with the engineering sales department of Chain Belt Co., Milwaukee, has been made New York district manager.

Stephen A. Douglas has been appointed general sales manager of the William R. Johnston Mfg. Co., Chicago, manufacturers of automobile equipment.

Frank B. Willis has been appointed sales manager of the Duplex Truck Co., Lansing. He was formerly sales manager of the Kelly-Springfield Truck Co.

W. T. Norton, Jr., chief engineer of the Motor Transport, has resigned, and at the present time has made no definite connections.

Frederick T. Frazer has been elected a member of the board of directors of the Byron G. Moon Co., Inc.

Water A. Wood has been elected president of the New York Automobile Dealers Ass'n.

HARTMAN TO LEAVE FORD

DETROIT, Feb. 21—Hubert E. Hartman, assistant secretary and general attorney for the Ford Motor Co., has announced his resignation, effective March 15. He gave as his reason a desire to enter business for himself, adding that he expected to continue to handle some of the company's affairs. Hartman has been with Ford seven years.

HANDLEY RE-ELECTED PRESIDENT

KALAMAZOO, MICH., Feb. 21—The annual meeting of the Handley-Knight company resulted in the election of the following officers and directors: President and General Manager, James I. Handley; vice-presidents, W. E. Upjohn and C. S. Campbell; secretary-treasurer, Walter L. Otis; directors, the above and C. A. Blaney, Kalamazoo; J. S. Woodward, Battle Creek, and Walter Stewart and Martin V. Kelley, Toledo.

STANDARD AERO BANKRUPT

PHILADELPHIA, Feb. 21—The United States Circuit Court of Appeals has affirmed an order of the District Court of New Jersey declaring the Standard Aero Corp. of New York a

bankrupt. The proceedings were on petition of Charles H. Leonard of Elizabeth, N. J., a creditor. The plant of the corporation at Plainfield is located on ground leased from Leonard, who sued in the New Jersey court and obtained a judgment for \$9,000.

The Aero corporation built airplanes for the United States and received payments of approximately \$5,000,000. Its business ended with the armistice and its relations with the Government were ended by the further payment of about \$1,000,000. This sum was disbursed and nothing was left except a bank balance of less than \$400.

Wilson Appointment Rests With Chrysler

NEW YORK, Feb. 23—When asked today whether or not he had been invited to accept the general management of the Maxwell-Chalmers combination, W. R. Wilson, who is one of the vice-presidents of the Irving National Bank of this city, referred inquiries to Walter P. Chrysler, chairman of the management committee, which will make the appointment. He intimated the subject had been taken up with him, but added that he could not say whether the appointment would come to him. Chrysler has declined to make any statement.

Wilson, who is about 35 years old, is better known as a financier than as a production man, although he has had considerable experience in the automotive industry. He was associated with the Studebaker Corp. until the formation of the Dodge Bros. Motor Car Co. He assisted the Dodge brothers in perfecting their organization and remained with them five years in a confidential capacity.

DETROIT S. A. E. TO MEET

DETROIT, Feb. 21—The Detroit Section of the Society of Automotive Engineers will hold its February meeting Feb. 25 at the Detroit Board of Commerce. O. C. Barry, research engineer of the Hupp Motor Car Co., and formerly professor of automotive engineering at Purdue University, will speak on the fuel problem in terms of miles per gallon.

PATENTEE SUES G. M. C.

BOSTON, Feb. 18—Rollin Abell of Milton, Mass., has entered suit in the Suffolk Superior Court for \$600,000 against the General Motors Corp. of New York for alleged repudiation by the defendant of an agreement to use a valve mechanism in connection with automobile engines, for which the plaintiff was to be paid not less than \$50,000 a year.

N. A. C. C. MEETING MARCH 3

NEW YORK, Feb. 21—A general meeting of the members of the National Automobile Chamber of Commerce will be held Thursday, March 3. The passenger car manufacturers will meet in the morning and the truck manufacturers in the afternoon. The directors of the Chamber will meet Wednesday morning, March 2, and the truck committee that afternoon.

Calendar

SHOWS

- Feb. 26-Mar. 5—Buffalo, Annual Automobile Show, Buffalo Automobile Dealers Ass'n, 74th Regiment Armory, C. C. Proctor, Mgr.
- Mar. 2-10—Des Moines, Annual Automobile Show, Coliseum, C. G. Van Vliet, Mgr.
- Mar. 5-12—Atlanta, Annual Automobile Show, Atlanta Automobile Dealers' Ass'n, Auditorium, Virgil Shepard, Mgr.
- Mar. 5-12—Brooklyn, Annual Automobile Show, Brooklyn Motor Vehicle Dealers' Ass'n, 23d Regiment Armory, George C. Lewis, chairman.
- Mar. 5-12—Pittsburgh, Annual Automobile Show, Automotive Ass'n, Inc., Motor Square Garden, J. J. Bell, Mgr.
- Mar. 5-12—Atlantic City, Annual Automobile Trade Association of Atlantic City, Million Dollar Pier, A. H. Generatzky, Mgr.
- Mar. 7-12—Syracuse, N. Y., Annual Automobile Show, Syracuse Automobile Dealers Ass'n, Armory, Howard H. Smith, Mgr.
- Mar. 7-12—Indianapolis, Annual Automobile Show, Indianapolis Automotive Trade Ass'n, Automobile Bldg., State Fair Grounds, John Orman, Mgr.
- Mar. 7-12—Nashville, Annual Automobile Show, Nashville Automobile Trade Ass'n, Page Bldg.
- Mar. 12-19—Boston, Annual Automobile Show, Mechanics Bldg. and South Armory.
- Mar. 14-19—Omaha, Annual Automobile Show, Omaha Automobile Trade Ass'n, Inc., Omaha Auditorium, C. G. Powell, Mgr.
- Mar. 14-19—Washington, Annual Automobile Show, Washington Automobile Dealers' Ass'n, Rudolph Jose, Chmn.
- Mar. 19-26—Detroit, Annual Automobile Show, Detroit Automobile Dealers' Ass'n, Morgan-Wright Building.
- April 3-9—Denver, Annual Automobile Show, Auditorium.
- April 4-9—Seattle, Annual Automobile Show, Seattle Motor Car Dealers' Ass'n, Arena Hippodrome.
- April—Chattanooga, Tenn., Spring Automobile Show, Chattanooga Automotive Trade Ass'n, Sunday Tabernacle, C. A. Noone, sec'y.

FOREIGN SHOWS

- Mar. 23-28—Witwatersrand Agricultural Show including machinery and motors sections.
- April, 1921—Sofia, Bulgaria, Tractor Trials, under the Bulgarian Ministry of Agriculture.
- May 28-June 8—International Automobile Exhibition, Basle, Switzerland.
- June, 1921—Reykjavik, Iceland, Agricultural Exhibition—Agricultural Machinery—Icelandic Agricultural Society, Reykjavik, Iceland.
- Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

CONVENTIONS

- May 4-7—Cleveland, National Foreign Trade Council.
- Oct. 12-14, 1921—Chicago, Twenty-Eighth Annual Convention National Implement & Vehicle Ass'n.

RACES

- July 24—Grand Prix, Le Mans.

S. A. E. MEETINGS

- Boston section—March 18.

Buffalo section—April 19—Paper on "Carburetor Performance," by F. C. Mock.

Dayton section—May 3.

Detroit section—March 25—Discussion of "The Relation Between the Industry and the Department of Engineering Research of the University of Michigan," by Prof. E. A. White.

Metropolitan section—March 10—Paper on "Brakes," by H. G. Farwell.

Metropolitan section—April 14—Paper on "Low Grade Fuel Carburetion," by A. H. Beach.

Midwest section—March 11—Discussion of storage batteries.

Minneapolis section—March 2—Discussion of good roads and equipment.

Minneapolis section—April 6—Discussion of repair equipment.

Washington section—March 18—Highway and Highway Transport Trading.

Washington section—April 1—Aeronautical Engineering Session.

Mexico to Construct Main Roads System

NEW YORK, Feb. 19—Approximately 22,000 kilometers of highways are included in the road improvement project of the Mexican government. This statement is made in a letter just received here from Salvador Medina, executive official of the Mexican Department of Roads and Public Works. Under the project the road work will be administered through regional groups, each of which will have a technical administrative center. Senor Medina describes the project as follows:

"This bureau has decided upon a project for the improvement of the leading roads of the Republic—a project covering the upkeep of all public roads during the present year, there also existing the plan of carrying out this work in all the States of the Republic, in accordance with a technical outline already approved. In the said project, roads are enumerated according to regional groups, which in due time will constitute actual zones of permanent attention, each one having a technical-administrative center.

"The center of each zone shall be Mexico City, Tampico, Queretaro, Guadalajara, Morelia, Iguala, Oaxaca, Tuxtla Gutierrez, Campeche, San Luis Potosi, Zacatecas, Chihuahua, Hermosillo, Ensenada and La Paz. The total extension of the roads covered by these zones is 22,000 kilometers."

LOWERS RATE ON STEEL PARTS

WASHINGTON, Feb. 18—An order was issued by the Interstate Commerce Commission this week requiring carriers to establish a rate of \$1.125 on the pressed steel side members of truck frames, no higher than rates on struc-

tural steel channels. The order followed a decision by the commission in the case brought by the Moreland Motor Truck Co. against the C. M. & St. P. Railroad, in which it was found that the rate of \$2.2115 per cwt. on pressed steel side members of truck frames, in carloads from Milwaukee to Los Angeles, was unreasonable.

Maxwell Contract Suit Moved to U. S. Court

TOLEDO, Feb. 19—The suit in which the Toledo Bridge & Crane Co. asks for a judgment of \$34,901.79 from the Maxwell Motor Co., alleged to be due for breach of contract, was remanded from the common pleas court of Lucas county to the Federal court for the Northern District of Ohio, Western Division.

The Toledo company alleges that it had a contract for 40,000 oil pans at \$2.50 each and that the contract was cancelled before completed.

The case brought a legal battle in the common pleas court but will be settled in the district court which is at the present time heavily loaded with business. The case will probably not be heard for several weeks.

CARRPLANE COMPANY FORMED

ATLANTA, Feb. 19—The first airplane manufacturing company in the South is to be located at Jellico, Tenn., the Southern Carrplane Mfg. Co., having been organized there with \$250,000 capital. The plane to be manufactured will be known as the Carrplane. It was designed by Capt. Walter J. Carr, formerly an army aviator. L. E. Woody is president and general manager of the company; W. I. Jones is secretary and treasurer.

Safety Regulations Reduce Car Accidents

NEW YORK, Feb. 18—More playgrounds, more safety education in the schools, uniform traffic rules, and regulations against overloading are among the measures which the National Automobile Chamber of Commerce will advocate with increased vigor during the coming year as part of its program to reduce the number of accidents incidental to the operation of motor vehicles. In urging these causes, the chamber plans to assist organizations already active along these lines rather than to stimulate independent campaigns.

Official figures show a decline in the ratio of fatalities to the number of cars in operation. Automobile deaths per car were 0.0025 in 1914, and these were reduced to 0.0013 in 1919.

ALABAMA AIR CLUB FORMED

ATLANTA, Feb. 19—The Alabama Aeronautical Society, affiliated with the Aero Club of America, has been organized at Birmingham, Ala. Lieut. Commander C. W. Tindal, formerly of the United States Navy, was the organizer. It will be conducted along the same lines as the New York State Flying Club and the Missouri Aeronautical Society.

TO STAGE FAIR IN JAVA

NEW YORK, Feb. 19—An automobile and tractor exhibition will be held at Bandoeng, Java, Sept. 19 to Oct. 9, 1921, in connection with the Second Netherlands East Indies Fair, which will be international in character and which offers to manufacturers an opportunity for exhibiting their products in the highly lucrative markets of the East Indies.